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Secția VIII

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TEXTILE FIBERS – PRESENT AND FUTURE DIRECTIONS

BY

OTILIA MĂLCOMETE and AURELIA GRIGORIU

The evolution recorded in the structure of textile raw materials has suffered – in various periods of time – significant mutations, induced by the development of science and technology – to be reflected both in their processing and in the steps made for creating a basis for both natural and chemical raw materials.

Thus, if at the end of the 18-th century (more exactly, in 1769) out of the raw materials – exclusively of natural origin – utilized (processed, obviously, manually) wool represented 77%, liberian fibers 18%, and cotton only 5%, a hundred years later – as a result of the industrial revolution – cotton comes to represent 81%, wool 13%, and liberian fibers 6%.

In the 20-th century, the amazing revolution occurring in both science and technology had a huge impact on the development of chemical industries, macromolecular chemistry, especially. Consequently, a new type of raw materials appears, namely chemical fibers; thus, in 1969 – again at a distance of 100 years – the structure of textile fibers is once again modified, as follows: cotton 54%, chemical fibers 38%, all the other natural fibers (wool, silk, and liberian fibers) representing only 8%.

The future directions of development in textile industries are conditioned, besides consumption, by the evolution of the extension of the main domains of utilization (besides the textile one), as well as by demographic considerations [1]. Thus, a very important direction in the development of the basis of raw materials is represented, apart from the synthesis of new fibers, by the improvement of the properties of both natural and chemical fibers.

Consequently, for improving the elasticity of cotton fibers, as well as for increasing their resistance to acids, microorganisms, etc., or for assuring them new characteristics, such as fire-proof or hydrophobic resistance, etc., either surface or total chemical modifications of the fibers are recommended, by different techniques such as elastomer insertions, grafting or substitution procedure, etc.

In the case of wool fibers, special treatments are required, for reducing contraction and fulling, as well as for increasing their resistance to chemical agents, alkalies, and oxidants especially, moths and insects or towards some physical agents [1,2], as well.

In the case of artificial, cellulose-based fibers, the main problem had in view is realization – by the application of new technologies – of rayon pulps with increased resistance to HWM-type wet or polynosic medium, as well as of some new fibers, such as fire-proof fibers (with various degrees of flame resistance), wool structures with permanent ondulation/curling, (ortho- or paracortex-type phase), strongly absorbant fibers, mass-dyed fibers, etc.

As to the synthetic fibers, the main investigations have been oriented to the amelioration or even total elimination of some of their deficiencies, manifested in time. To this end, in various stages synthetic fibers with higher hygroscopicity (similar to that of the natural fibers – cotton and wool) and touch close to that of natural silk have been obtained, as well as antistatic, fire-proof resistant, thermoresistant (especially the carbon- and graphite-made ones) and antimicrobial fibers, mineral (glass, basalt) and metaloplastic fibers.

The large diversity of the fibers obtained by modern technologies refers mainly to the category of “new-generation” fibers. The actual trend towards the diversification of synthetic fibers involves chemical and/or physical and – to a lesser extent – the synthesis of some new classes of polymers as raw materials for fibers [3,4].

Development of the range of chemical fibers, especially of the synthetic ones, will result in an increased consumption of fibers, both for textiles and other technical domains.

The 1960 initial prognosis of the world wide production of fibers, an increase of 66 and 74%, respectively, has been forecasted for 1990 and 2000, as against a decrease of the share represented by natural fibers (cotton and wool) up to 26% in 2000. Nevertheless, this estimation, announcing a massive development of chemical fibers – within which the share of the synthetic ones was of 90% against only 10% of the artificial ones – for the year 2000 – had not considered the serious world oil crisis [1-8].

According to a more recent prognosis, made by Chematex (USA) the total amount of chemical fibers to be produced in 2000 will represent 54-56%, in parallel with 46-44%, for natural fibers (cotton and wool), which will bring about a rebalancing of the natural-chemical fibers ratios [6].

Increase of the cotton fibers share was due both to a considerable extending of the cultivated surfaces and, especially, to increasing of the fiber yield/ha. In the case of wool, the increase was not spectacular, as estimated for the future, too. In this respect, the main investigations are devoted to the melioration of sheep breeds, for the obtaining of fibers with increased fineness.

Another effect of the oil world crisis – having brought – about rising of its price and consequently, of the synthetic fibers, dependent on this raw material, too – was the orientation of the researches towards the obtainment of synthetic fibers from high quality cellulose with superior structure. Thus, in recent years, remarkable progresses have been recorded in the fabrications of viscous fibers. In this connection, continuous-flow processes have been applied with a high degree of automatization and reduced material consumption, in parallels, with the recovery – from ecological considerations – of some chemical substances [2].

New researches are in progress, such as solvent-based systems and methods of dry spinning of viscose.

Besides polynosic and modal fibers, fire-proof tubular fibers, fibers with contrast effect, graphite-fibers from viscose, with high resistance, absorbent, shaped, permanently-curved fibers are produced nowadays [9-16].

In the coming years, the estimations made refer not only to the increase of the production of qualitatively superior fibers, but – to an equal extent – of the production of silk-type thread-like yarns, special attention being paid – in this connection – to the technologies necessary for the obtainment of very fine, textures filaments. As to the domain of synthetic fibers, the world production increased considerably; thus, comparatively with 1960, when the whole production was of 700 tons, in 1988 it reached 18,600 tons, the estimated value for the year 2000 being of 23,000 tons/year. The main share is represented by polyesteric fibers (42%), followed by polyamides (20%), polyacrylonitrile (15%), and other categories.

For the years to come, japanese researchers oriented their activity towards the diversification of fibers and filaments based on traditional products (polyester, especially), in view of securing them properties similar to those of the natural fibers (firstly, hygroscopicity and handle), and the aspect of thread-like yarns spinned from short, antistatic, antidirt, fire-proof fibers, etc. Another concern refers to the obtainment of "microfine" fibers of extreme fineness, for the fabrication of synthetic leather, as much as possible similar to the skin of wild beasts [17-21]. Also, the japanese industry of fibers is reoriented towards the fabrication of special fibers – produced in no other part of the world –, thus avoiding a general crisis of both industry and research.

The general world preoccupation for the development of textile raw materials is towards the obtainment of so-called "ideal fibers" ordered for different domains of application, on knowing that no "universal" fiber – with general application – does exist consequently, the main directions for the diversification of the synthetic fibers include [22-27]:

- the synthesis of polymer and/or copolymers with special, definite destination;
- technologies of spinning and subsequent processing (bicomponent, biconstituent, composite fibers, lumen-containing fibers, fibers with internal microcavities, epitropic fibers, etc.);
- surface modifications by chemical or physical treatments (polyester's saponification, for increasing its hygroscopicity, dyeing capacity, handle);
- softening treatments, mainly with siliconic products, securing special handle, very high capacity of elastic recovery and special voluminosity, as well as with various fluorescent agents, fluorescent fibers being finally obtained;
- metallization of filamentary fibers with silver or aluminium for special purposes;
- processes of controlled pyrolysis of precursor polymers for the obtainment of carbon and graphite fibers or, more recently, the utilization of intermediary forms of air-oxidation of the "Panox" acrylonitrile;

- spinning of liquid crystals for the obtainment of thermoresistant fibers of the aramide type.

All these directions do not exhaust - by far - the existent possibilities of fibers' diversifications. Consequently, the Romanian industry and research in the field of chemical fibers have been oriented to such ends-significant examples being offered by the large of copolyesters, modified acrylic fibers, polypropylenes and polyamides. Special interest has been paid to the elaboration of new technologies for the realization in our country, of insoluble polyvinylalcohol fibres. Completion of the large variety of synthetic polymers by polyalcoholvinyllic ones might contribute, to a significant extent, not only to a quantitative increase of the basis of raw materials but also to the qualitative diversification of the textile products, the more so that such fibers are expected to substitute - quite soon - the imported cotton.

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FIBRE TEXTILE - PREZENT ȘI VIITOR

(Rezumat)

Sunt prezentate tendințele generale în sinteza și folosirea fibrelor textile la sfârșitul secolului XX, fiind trasate în același timp și căi de diversificare a sortimentelor pentru perioada următoare.

INFLUENCE OF ASBESTOS FOAMS COMPOSITION ON THEIR COMPRESSIBILITY

BY

SVETLANA V. MILOSAVLJEVIC, TATJANA A. MIHAJLIDI,
SLAVENKA A. LUKIC and TANJA J. TADIC

1. Introduction. In order to discover new, ecologically more acceptable technologies for adequate and harmless application of some valuable, but nowadays "condemned" raw materials, different approaches are known. It is especially the case with asbestos, an engineering material "with thousand qualities and only one disadvantage" – provocation of some serious health hazards by the inhalation of asbestos dust being generated during mechanical operations, inevitable in conventional asbestos technologies or during the processing of asbestos containing materials. The chemical approach to the production of asbestos textiles, i.e., asbestos-based insulation materials, known as "dispersion technology" [1] eliminates practically all dust-generating operations as opening, carding, etc. Its advantage is the wet processing of asbestos which begins with the fibrocolloidal dispersion of asbestos in the solution of surfactants, followed by the extrusion and coagulation of asbestos slurry in the solution of salts of polyvalent metals. The yarns or films formed with the use of this method may represent a type of man-made products, whose relation to classical asbestos yarns is similar as cotton staple yarns are related to viscose filaments [2]. Another, even more practical way for obtaining a kind of asbestos non-woven fabric in only one operation is by casting and drying asbestos slurry in perforated moulds. The final product is a porous tissue with the textile identity and structure typical for polymer foams, suitable for application as lightweight, flexible insulation material.

The special property of dispersion technology is that it has practically unlimited possibilities by mixing of different components in dispersion before shaping. In this respect, it was interesting to study the influence of inclusion of the short asbestos fibers of inferior quality in such materials, in order to enable their application; although these fibers are abundantly present in some parts of the world, they have no use as flexible isolation materials. First part of this investigation is related to the assesement of the technological parameters of making asbestos foams in laboratory conditions. The variables which were used are: the time of swelling of asbestos in the solutions of surfactants, time of mechanical agitations to produce

asbestos slurries, asbestos fiber concentration in dispersion, temperature of thermal treatment after casting in perforated metal moulds, and quality class of asbestos fiber. The measurement of density, "water retention value" and compressibility of materials which were obtained in these experiments pointed out the influence of some parameters on the properties of asbestos foamlike materials [3].

In the second part of this investigation the influence of axial compressive stresses on porosity of asbestos foams was studied, in connection with the influence of isolation materials porosity on their thermal properties, as well as because of high probability that this type of isolation material would be exposed to compression during the exploitation.

2. Theoretical. For assesment of the influence of the repeated compression on porosity of non-woven asbestos fabrics of foam type, the following relations were used. Porosity V_p was determined as the relative change of density, i.e.: $V_p = [(\rho_v - \rho)/\rho] \cdot 100$, (%), where ρ was the density of foam and ρ_v - the density of fiber mass, which for asbestos was taken as 2.5 g/cm^3 .

During compression of foam, in the case that residual deformation after compression existed, the volume of material was irreversibly decreased for ΔV , and the density has been increased to ρ_1 , i.e.:

$$\rho_1 = m/V_1 = m/(V - \Delta V) = m/[V(1 - \Delta V/V)] = \rho/(1 - \epsilon_m/100),$$

where $\epsilon_m = (\Delta V/V) \cdot 100$ (%) was the relative volume change. Similarly, in the case that compression was repeated n times, porosity of sample, V_{pn} , could be calculated by the equation given:

$$V_{pn} = \{1 - \rho/[\rho_v(1 - \epsilon_{m1}/100)(1 - \epsilon_{m2}) \cdots (1 - \epsilon_{mn})]\} \cdot 100 \text{ (%)}$$

3. Experimental

3.1. Sample Preparation. The experimental conditions of sample preparation were chosen as the result of the preliminary study summarised in Table 1. In all these cases, asbestos foams were formed from solutions of surfactants that contained 8 g/l Na-oleate and 1.2 g/l Na-dodecyl benzenesulfonate [4]. Asbestos spinnlabe fiber of class 3 from Rhodesia was used. The content of open pores in asbestos foam was indirectly determined by measuring "water retention value", WRV . This parameter was calculated as the difference between the mass of the sample immersed during 10 min. in distilled water and centrifugated under constant conditions (1500 min^{-1} , 10 min.), and the mass of dry sample, expressed in % of dry sample mass. The density of asbestos foam was determined as relation of sample mass and its volume determined by measurement of its outer contours.

Four series of experiments were performed. In each of them one of parameters of dispersion-making process was varied. In the series presented in column "a" in the Table 1, the time of swelling in surfactant solution was varied, the concentration of asbestos (20 g/l) and the temperature of drying, (150°C) being kept constant. The results from the column "b" are related to the series of experiments

Table 1
Optimization of Asbestos Foam Forming Conditions

Standardized parameters ($\times 10^{-2}$)	a				b				c					d			
	Time of swelling (days)				Fiber concentration (g/l)				Time of agitation (h)					Temperature of drying (°C)			
	0	1	2	7	10	20	30	40	1	2	3	4	8	20	50	100	150
ρ/ρ_{opt}	100	111	112	108	153	100	124	150	100	97	104	200	283	107	105	102	100
WRV/WRV_{opt}	100	99	118	112	87	100	79	60	100	98	84	76	76	99	104	114	100
$\varepsilon_{m1}/\varepsilon_{m1opt}$	100	92	100	102	97	100	104	97	100	102	103	95	87	100	104	103	100

in which independent variable was the fiber concentration in dispersion, but the time of agitation and the temperature of drying were always one hour and 150°C, respectively, the swelling being omitted. Similarly, results in columns "c" and "d" concerne duration of agitation and temperature of drying as independent variables, other parameters of the process being kept constant, i.e., concentration of asbestos was 20 g/l and the preliminary swelling was not applied in these experiments. The results obtained enabled the choice optimum conditions of asbestos foams production. In order to compare the relative intensities of single parameters influence on the forming process of asbestos foams, all values presented in Table 1 are standardized to the optimum results, which were afterwards used in the process of forming of all studied samples.

In this way, asbestos foams were produced under following conditions: time of mechanical agitation - 1 hour, asbestos fiber concentration - 20 g/l, temperature of drying - 150°C. Previous swelling in the solution of surfactants was not applied. Such conditions enabled forming of very lightweight materials, with densities located mostly in the region of correspondent values for polymer foams. (In the case when the spinnable asbestos fiber of class 3 was used, the produced nonwoven foamlike asbestos fabric had the density 0.033 g/cm³, its "water retention value" was 137% and its relative volume deformation under pressure of 312 kPa was 88%.)

4. Results and Discussion. The results from Table 1 point out that the influence of asbestos swelling in water solutions of surfactants on the bulk of foams is negligible as well as it is on the quantity of water retained in their open pores and on their compressive behaviour. However, the differences in the observed characteristics of foams which were formed under variation of preliminary swelling in an interval of 0-7 days did not prove to be statistically significant. For this reason the preliminary swelling of asbestos fiber in water solution of surfactants was omitted in all subsequent experiments.

As expected, the density of foams changed with different quantity of asbestos fiber in dispersion. The results presented in Table 1 show that the least density was obtained with the concentration of 20 g/l which corresponds to the available data from literature [5] as well as to earlier results of the authors [6]. Compressibility of the samples studied, expressed as the relative volume change after compression, was high, but it is not likely to be significantly dependent on asbestos fiber con-

centration in dispersion, this fact clearly being demonstrated in Table 1, column "b". From these results it might be concluded that fiber concentration in dispersion does not influence the elastic properties of foams, but that these properties are probably determined by the elastic properties of asbestos fiber itself. The time of agitation proved to have an influence on asbestos foams density. The data from Table 1 show that materials obtained under agitation during 1, 2 and 3 hours have approximately the same values of densities. The continued dispersing provoked shortening of asbestos fibers as well as their entanglement, with final effect similar to that obtained with the introduction of inferior-quality asbestos fibers in dispersion. If the fiberisation of asbestos complexes was hindered, the foams densities were increased, i.e., doubled for samples obtained by agitating during 4 hours in the solution of surfactants, or almost tripled in the case agitation lasted 8 hours.

Temperature of drying did not prove to have an important influence on asbestos foams characteristics. However, higher temperatures changed in a certain degree esthetic properties of foams, provoking the change of their colour from white to brown. The reason for this colouration was destruction of retained organic chemicals in asbestos material. For this reason the temperature of 150°C was chosen as low enough to prevent thermal degradation, in all subsequent experiments.

From the economical point of view, a special interest has a study of the influence of raw material's quality on the possibility of partial substitution of spinnable asbestos classes for inferior-quality components (classes 4 and 5). In Figs. 1 and 2 curves that demonstrate the change of density and *WRV* with the introduction of inferior-quality asbestos fibers in dispersion mixture, containing the fiber of class 3, are shown. It is obvious that densities are increasing while porosities (i.e., *WRV*) are decreasing with the increase of inferior-quality asbestos fiber content in mixture, and that the influence of these components is being greater on density than on *WRV* change. The densities of foams in the case of total substitution of spinnable asbestos for asbestos classes 4 and 5 were 9.7 and 10.4 times greater, respectively; in the same time, *WRV*s were diminished 3.0 and 4.5 times. It might be concluded that foams made of inferior-quality asbestos class 4 have in their structure slightly more open pores than asbestos foams made from asbestos class 5. On the other hand, the content of the asbestos fiber of class 4 less than 50% is likely to have a weaker influence on foams properties than asbestos fiber of class 5.

In Table 2 are presented the values of densities and *WRV*s of asbestos fiber foams as a function of inferior-quality asbestos fiber content in dispersion mixture, immediately after forming and after the first and the second exposure to compressive stresses (in all cases with maximal pressure of 312 kPa).

The results presented in Table 2 show that first compression brings an important increase of the sample density and decreases their bulk, but that under repeated compression these properties are not additionally changed. It was the reason why the authors did not continue with further compressive cycles. On the other hand, the results from Table 2 are showing that asbestos foams, even after second compression, retained the air in their structure in a great extent, this fact being very important for their insulative properties. Especially good characteris-

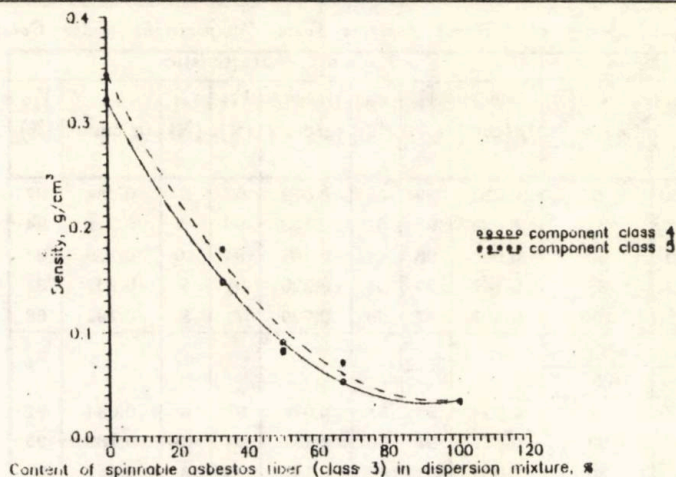


Fig. 1.- Influence of asbestos foam composition on its density

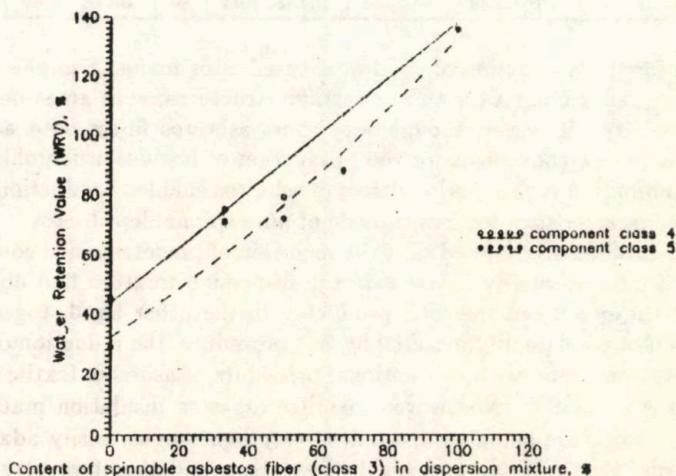


Fig. 2.- Influence of asbestos foam composition on its water retention value (WRV)

tics in this sense showed asbestos foams containing more than 50% of spinnable asbestos fiber of class 3, as their bulk was greater than 90%, even after the second compression.

5. Conclusions. Asbestos foams, as a new engineering material, obtained in controlled experimental conditions, represent lightweight porous materials, with great capacity of water retention in their open pores, as well as with great compressibility. Some of these properties are found in samples produced partly from short asbestos fibers. The great differences in the properties of foams made from long (class 3) and short (classes 4 and 5) fibers, pointed out the importance of raw ma-

Table 2
Density and Porosity of different Asbestos Foam Compositions under Compression

Asbestos foam composition (%)		Foam characteristics							
class		ρ (g/cm ³)	V_p (%)	ε_p (%)	ρ_1 (g/cm ³)	V_{p1} (%)	ε_{p1} (%)	ρ_2 (g/cm ³)	V_{p2} (%)
3	4								
100	0	0.033	99	58	0.079	97	6	0.084	97
67	33	0.052	98	61	0.133	95	6	0.141	94
50	50	0.090	96	44	0.161	94	10	0.179	93
33	67	0.147	94	35	0.220	91	5	0.232	91
0	100	0.321	87	56	0.729	71	8	0.792	68
class									
3	5								
100	0	0.033	99	58	0.079	97	6	0.084	97
67	33	0.071	97	55	0.157	94	13	0.180	93
50	50	0.082	97	45	0.149	94	8	0.162	93
33	67	0.178	93	45	0.323	87	4	0.346	86
0	100	0.344	86	53	0.732	71	6	0.778	69

terial choice for the production of good-quality asbestos foams. Samples produced from inferior-quality fibers were thin, paperlike structures, with great density and negligible porosity. However, though very short asbestos fibers used as a single component were not convenient for the production of insulation foamlike materials, their combination with superior classes of asbestos enabled production of foams with typical characteristics for foams made of pure spinnable asbestos.

Experimental results showed that the inclusion of predetermined content (less than 50%) of inferior-quality asbestos in the dispersion mixture had no essential influence on the quality of the final product. On the other hand, together with the realization of good quality material by this procedure, the reduction of production costs, in comparison with conventional procedure of asbestos textile materials making, can rise to 30%. Non-woven foamlike asbestos insulation materials obtained in this work are being recognized as very lightweight, easily adaptable to different forms, thermostable and highly insulative, and therefore very interesting as insulation materials for objects exposed to high temperatures, as well as to aggressive chemicals, bacteria and insects. These specific properties give to asbestos foams, as an inorganic material with a textile identity, an advantage when compared with more rigid and expensive asbestos textiles products. Therefore they may be suggested as more or less acceptable alternatives for asbestos in the frame of the principle "replacement of asbestos by asbestos itself".

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INFLUENȚA COMPOZIȚIEI SPUMELOR DE
AZBEST ASUPRA COMPRESIBILITĂȚII LOR

(Rezumat)

Pentru a se explora unele posibilități de „renaștere” a azbestului s-a aplicat metoda de obținere a spumelor similare cu unele tipuri de neșesute. Principiul tehnologic adoptat este cel de filare din dispersie pe baza proprietăților complexilor azbestului de a se dezintegra și de a forma soluții fibroase coloidale care pot fi prelucrate ușor în diferite forme.

L'INFLUENCE DE CERTAINES CONDITIONS DE FILLAGE SUR LES PROPRIETES ET SUR LA STRUCTURE DES FILS TECHNIQUES EN POLYESTER

PAR

JULIETA HOMUTESCU et V. BLAȘCU

1. Introduction. Les fils synthétiques filés de l'état fondu présentent de différents degrés de cristallinité et une forme plus ou moins stable des cristaux. La cristallinité ensemble avec l'orientation influencent fort les indices physiques des fils et leur comportement dans l'étréage. On a prouvé par des moyens expérimentaux que la structure cristalline, le degré de cristallisation et la morphologie des zones cristallines sont étroitement liés aux conditions de fillage et premièrement à la relation température-temps [1]. Dans le cas des fils filés de l'état fondu l'un des facteurs les plus importants en ce qui concerne l'influence sur les paramètres de la structure cristalline est la vitesse de refroidissement du filament après la sortie de la filière. Les conditions thermiques et mécaniques de formation des fils au fillage doivent être tout à fait constantes et biensur différentes sur la hauteur de la machine à filer, mais sans variations graves sur la sections transversale de la tour à filer [2].

Les irrégularités des filaments filés sur des portions de longueur de 0,5 à quelques mètres auront pour causes des galets, des bobines et des dispositifs de friction. Des zones défectueuses déterminées par le système de refroidissement ont la longueur de 15-30 m et celles déterminées par les pompettes influencent surtout le titre et dépassent 50 m. Par l'analyse de pourcentage de l'influence de différents facteurs sur les oscillations de titre on a constaté que l'air de refroidissement a une influence dominante (20-30%) [3-5].

Tout mouvement incontrôlable de l'air dans la zone d'issue de la filière du filament mène à un refroidissement sans uniformité de filament qui détermine des variations appréciables du titre et de la structure.

Il est important que chaque filament individuel soit refroidi uniformément aussi bien à l'intérieur qu'à l'extérieur et que la température intérieure et de surface soit au-dessous de la température de transition d'ordre 11 [6-8].

À ce moment à la fabrication des fils synthétiques on utilise quelques sortes de systèmes de refroidissement: à jet transversal, à l'insufflation et à jet vers l'extérieur.

Dans le choix du système optimal de refroidissement on doit tenir compte de l'économicité et de la qualité du fil obtenu.

Au fillage des fils techniques en polyester on utilise la chambre de refroidissement à l'air au jet transversal. L'air avec une grande turbulence (au refoulement il a 15-25% turbulence) est laminé par un système réglable de chicanes et de sas pour lui uniformiser et régler la pression. Par l'intermédiaire de ce rectificateur on réduit la turbulence de l'air à moins de 2%.

Parce que dans le cas du fillage à vitesse normale, du point de vue structural, après le fillage il est préférable qu'on obtienne des fils isotropes et amorphes, qui présentent après l'étirage une structure cristalline bien précisée pour les fils textiles en polyester on a utilisé aussi le système de refroidissement avec de l'eau-aérosol.

Selon cette méthode dans cette ouvrage on a utilisé des variantes appliquées aux fils techniques en polyester de 1100/192 dtex. On a modifié les conditions de refroidissement réalisant quatre variantes de fils expérimentales, en comparaison avec le fil t'moin obtenu du même lot de granules par la technologie habituelle, selon le tableau ci-dessous:

Le nombre de la variante	Les conditions de refroidissement au fillage
1	Pulvérisation de l'eau+air chaud
2	Pulvérisation de l'eau
3	Pulvérisation de l'eau+air chaud+jet d'air
4	Air chaud+jet d'air
5	Production courrente (air chaud)

Pour chaque variante on a obtenu une paire de bobines; on a déterminé les paramètres des diagrammes effort-allongement et le numéro des cycles jusqu'à la rupture dans l'analyse de sollicitation cyclique répétée.

À toutes les cinq variantes analysées on a constaté une non-uniformité accentuée à la longueur du fil, à toutes les bobines, mais les valeurs moyennes sont proches. En échange, le comportement a des sollicitations cycliques répétées montre une certaine supériorité qualitative dans le cas de la première variante qui présente une valeur avec plus de 30% plus grande que dans le cas de la variante-témoin.

Tableau 1
Caractéristiques mécaniques

Numéro de la variante	Densité linéaire (dtex)	E (cN/dtex)	Paramètres de rupture			Numéro des cycles sollicitations répétées
			cN/dtex	Cv%	ε_r %	
1	1112,62	83,79	6,54	9,88	12,39	11363,25
2	1112,67	85,42	6,34	5,54	13,68	10477,5
3	1124,41	84,21	6,28	9,64	12,23	10287,0
4	1128,95	81,13	6,51	7,36	12,63	9756,0
5	1133,81	83,66	6,62	8,59	12,59	8310,0

Par l'étude des caractéristiques physico-structurales (tableau 2) on constate que les premières deux variantes présentent les valeurs les plus élevées pour le temps critique de dissolution, caractéristique qui reflète la taille et la stabilité de cristallites. Les mêmes variantes ont aussi une meilleure uniformité structurale, fait prouvé par les valeurs plus réduites du coefficient de variation de cette caractéristique. La densité déterminée par la méthode de la colonne de gradient de densité, présente des valeurs assez proches pour toutes les variantes analysées, fait dû probablement à la non-uniformité élevée sur la longueur du fil technique.

Tableau 2
Caractéristiques physico-structurales

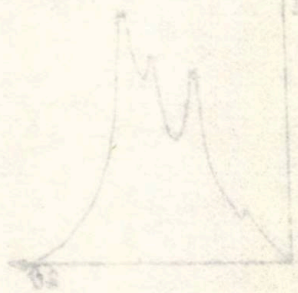
Numéro de variante	Contraction (%)	TCD Valeur moyenne (s)	Cv (%)	Densité (g/cm ³)	Analyses rayons X cr (%)	Dimens. cristals Å
1	12,645	175,0	13,14	1,3866	37,9	52,0
2	12,380	182,5	11,53	1,3844	40,5	54,0
3	13,510	152,0	17,62	1,3814	39,2	45,5
4	13,390	162,0	14,27	1,3840	37,4	50,0
5	13,630	141,0	22,66	1,3845	35,45	48,5

De l'étude des analyses de structure par diffraction en rayons X (figures 1-5) on constate que toutes les quatre variantes expérimentales présentent, en comparaison avec la preuve témoin, un degré de la cristallinité un peu plus élevé et aussi, en général, les dimensions des cristallites plus grandes. Les valeurs les plus élevées pour ces paramètres structuraux correspondent aux variantes 1 et 2 qui présentent aussi le meilleur comportement à sollicitation cyclique.

2. Conclusions. Par le système de refroidissement des filaments en polyester dans des conditions de pulvérisations très fine de l'eau simultanément avec l'action de l'air (la première variante) on assure des caractéristiques beaucoup améliorées du point de vue du comportement aux sollicitations répétées de flexion. Des analyses physique-structurelles effectuées, les valeurs pour le temps critique de dissolution, pour le degré de cristallinité et la dimension des cristallites sont en général plus grandes pour les variantes avec un meilleur comportement aux sollicitations cycliques.

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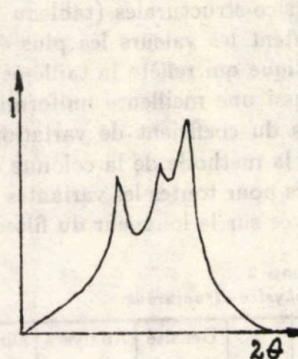


Fig. 1

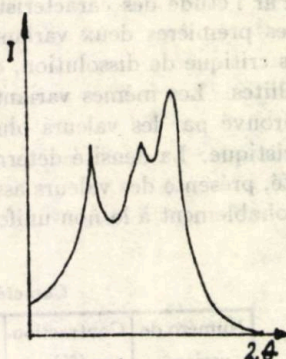


Fig. 2

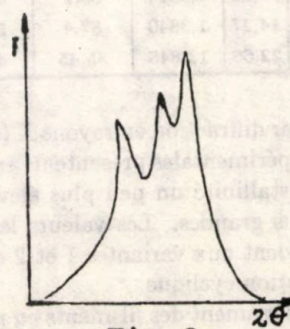


Fig. 3

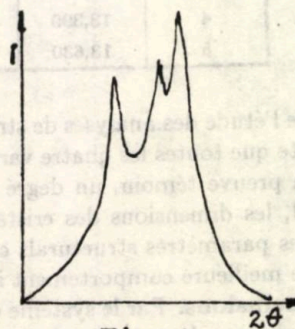


Fig. 4

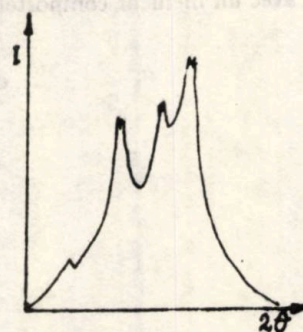


Fig. 5

Les diagrammes de diffraction en rayons X pour les fils 1-5.

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INFLUENȚA UNOR CONDIȚII DE FILARE ASUPRA PROPRIETĂȚILOR
ȘI STRUCTURII FIRELOR TEHNICE POLIESTERICE

(Rezumat)

Se prezintă câteva variante de răcire utilizate în timpul filării la fire tehnice poliesterice. Firele obținute au fost analizate din punct de vedere structural și mecanic.

**STUDY OF THE PHYSICO-CHEMICAL AND
MECHANO-RHEOLOGICAL PROPERTIES OF SOME
SUPERFICIALLY-MODIFIED SYNTHETIC FIBERS
BY NON-CONVENTIONAL PHYSICAL METHODS**

BY

V. BLĂȘCU, OTILIA MĂLCOMETE and BOGDAN SIMIONESCU

1. Introduction. Cold plasma represents one of the states of the ionization of the gaseous mixture made of ions, electrons and electrically neutral particles, in which the number of electrically-charged carriers is equal, which makes plasma an electrically neutral formation [1].

This material state may be obtained by various procedures [2]. The most advantageous one is the technique of electrical discharges in gases, which does not involve degradation of the fibrous material, if the discharge temperature is low. The condition required is to work in a high vacuum. At a pressure of 13 kPa, a gas temperature of 150°C may be produced, while decrease of the reactor pressure induces decreases of the working temperature, too, up to attaining values of the temperature of the environment within which the reactions proceed.

Low temperature plasma materials, specific for the treatment of textile materials represent weakly-ionized plasma materials, in which the mass transfer occurs through non-elastic atom-atom and electron-atom impact.

Due to the parabolic profile of the rate gas flow through the reactor, a non-uniform distribution of the concentration of the active species is formed and a temperature gradient appears [3]. The concentration of the active species is higher in the region of the reactor walls than in the median region, that is the thermal effect is increased in the center of the discharge and decreased as it moves to the tube edges. Evaluation of the gas temperature involves a series of factors, that prevent any anticipation of the caloric effect; that is why, the only way for knowing the thermal state of the plasmatic gas is by experimental determinations [4].

Neglecting of the thermal effect may lead to contradictory experimental data, for example, in the polyester treatment, either the corrosion effect or that of the polymer surface reticulation may be predominant which further lead to getting different tensional indices for the fibers taken into account.

The energy transfer between plasma and textile materials occurs by means of radiations and flows of both neutral and ionic particles.

Low temperature plasma may be obtained in an electromagnetic field of arbitrary frequency, starting with the continuous current ($f = 0$ Hz) and ending with microwaves frequencies ($f = 300$ Hz). At frequencies higher than 1 MHz, no direct contact is necessary between the electrodes forming the electromagnetic field and the gas on which the discharge is to be excited. In such a situation, the electrodes may be placed on the outer side of a glass tube filled with gases at suitable pressures. This is actually the method we have applied for plasma production.

The modifications caused by plasma upon fibers may be classified into two groups, namely:

- surface modifications, occurring at a 5 nm thickness;
- "in-depth" modifications, covering a layer of up to 5×10^3 nm thickness, manifested as formation of radicals, reticulation, removal of the hydrogen free from the type of gases having been utilized for plasma excitation.

2. Experimental. In order to follow the influence of the conditions of cold plasma on some properties of the synthetic fibers, short polypropylenic (PP) and polyesteric (PES) fibers, with the same fineness (0.444 tex) have been studied.

0.444 tex polypropylenic fibers have been treated in plasma installation, in an atmosphere of nitrogen and air. The experiments have been conducted under the following conditions:

- power of the radiofrequency field, dissipated on electrodes: 500, 1,000 and 1,500 W;
- pressure in the reactor: 3 mm Hg;
- time of samples keeping in the reactor.

Certain processes of fibers destruction and reticulation have been observed.

Initial weight losses of the plasma-treated fibres increase with increasing the power of the applied field.

The nature of the low molecular weight compounds (H_2 , H_2O) removed from the surface of the treated fibers has been analyzed by gas-chromatography.

Also, electronic microscopy has evidenced the formation of certain roughness on the fibers surface, the more pronounced, the higher the treatment power is.

There have been determined the molecular weights, hygroscopicity, fineness, as well as the mechanical indices of tenacity and relative elongation to breaking for the reference and cold plasma-treated samples.

The molecular weights have been determined for polypropylenic fibers viscometrically, from solutions of tetralyne, while hygroscopicity has been calculated by climatization and thermal conditioning.

Fineness has been determined both by individual measurements of diameter and by the method of segmentation.

The mechanical indices have been established by traction stress, on a Fafe-graph-type dynamometer, the average values of 30 determinations are listed in Table 1.

The data presented in Table 1 indicate the installation of certain reticulation and distruction processes within the treated fibers.

Table 1
Physical and mechanical parameters obtained
for cold plasma-treated Polypropylene fibers.

Sample	Experimental conditions			Molecular weight $\times 10^{-4}$	Higroscopicity %	Fineness (tex)	Tenacity σ_r (cN/tex)	Relative elongation ϵ_r %
	Nature of gas in the reactor	Exposure time (min)	Power W					
Reference PP	—	—	—	15	0.031	0.444	56.43	31.20
Treated PP	Nitrogen	15	500	18	0.038	0.450	44.88	22.40
Treated PP	Nitrogen	15	1000	12	0.050	0.462	38.23	29.87
Treated PP	Nitrogen	15	1500	11	0.070	0.474	22.40	34.60
Treated PP	Air	15	500	16	0.065	0.457	48.21	32.00
Treated PP	Air	15	1000	14	0.082	0.482	46.38	40.64
Treated PP	Air	15	1500	13	0.098	0.510	43.32	54.00

The fibers treated in nitrogen plasma, at low power values (500 W) evidence increased values of their molecular weights, while the support fibers, treated in air plasma, at very high power (1,500 W) show decreased values of their molecular weights, as compared with the value of the reference sample.

Increase of the fibers hidroscopicity with increasing the energy of the cold plasma is indicative of the fibers superficial "corrosion", by the creation of some microcavities capable to retain water, as a result of the effect of capillarity.

The fibers fineness increases with increasing the plasma power, which is even more evident with air treatments – an explanation for the macroscopic modifications occurring in the fibers structure.

Evolution of the mechanical indices agrees with the evolution of the other properties. More than that, by applying the C o p l a n d method to the loads-deformation curves, there have been also determined the other parameters of the limits of elasticity, flow, elasticity modulus, specific mechanical work of deformation – parameters having the same evolution as those of tenacity and relative elongation at break (Table 2).

The experimental values of the physico-mechanical indices attest the installation of advanced processes of distruction and reticulation in the polypropylenic fibers treated at high power, in air atmosphere.

Similar processes of distruction and reticulation have been observed, too, with polyesteric fibers, being more pronounced in air than in nitrogen atmosphere.

In the case of polyesteric fibers, too, the experimental conditions have been the same with those applied on plasma-treatments of the polypropylenic fibers. For the treated samples, there have been determined the index of solubility, fineness, as well as mechano-rheological parameters.

Solubility has been determined gravimetrically, from solutions of phenol-tetrachlorethan 3:2 solvent and 0.5 g fiber, for 2 hours.

Fineness has been calculated both by individual diameter measurements on a Lanameter (500 x), employing a reference batch of 100 fibers, and gravimetrically.

Table 2
Physical and mechanical parameters obtained for Polypropylene fibers.

Initial modulus of elasticity, E_I , cN/tex	Limit of elasticity		Limit of flow		Specific mechanical work Lms , cN/tex	Contraction in air, at 100°C, %	Sample
	σ_e , cN/tex	ϵ_e , %	σ_c , cN/tex	ϵ_c , %			
522.4	24.48	3.48	32.42	12.36	8.80	12.4	reference PP
508.2	22.31	3.98	33.41	13.42	8.61	13.2	N i t r o g e n A i r t r e a t e d P P a t 500 W 1000 W 1500 W 500 W 1000 W 1500 W
486.1	19.02	4.32	34.10	14.81	8.20	15.0	
450.8	17.30	6.18	30.02	16.90	7.12	17.0	
496.2	21.22	3.70	33.92	13.89	8.55	13.6	
452.1	18.10	4.88	34.90	15.20	7.60	16.7	
399.3	12.01	7.04	37.11	18.20	6.10	18.5	

The mechanical parameters have been estimated by the method of Copland, interpreting the load-deformation curves recorded on a Fafegraph-type dynamometer.

The results obtained are listed in Tables 3 and 4.

Table 3
Physical parameters obtained for cold plasma-treated Polyester fibers.

Sample	Experimental conditions			Fineness [tex]	Higroscopicity %	Solubility %
	Nature of the gas	Time [min]	Power [W]			
Reference PET	—	—	—	0.444	0.410	100
Treated PET	Nitrogen	15	500	0.460	0.418	81.0
Treated PET	Nitrogen	15	1000	0.477	0.430	63.1
Treated PET	Nitrogen	15	1500	0.483	0.457	52.3
Treated PET	Air	15	500	0.490	0.480	67.2
Treated PET	Air	15	1000	0.514	0.520	41.2
Treated PET	Air	15	1500	0.541	0.590	22.3

Mention must be made of the decrease of the soluble rate with fibers treated at higher powers, which is even more pronounced with treatments in air.

Table 4
Mechanical parameters obtained for cold plasma-treated Polyester fibers.

Sample	Initial modulus of elasticity E_I , cN/tex	Limit of elasticity		Limit of flow		Limit of break		Specific mechanical work Lms, cN/tex
		σ_e cN/tex	ϵ_e %	σ_c cN/tex	ϵ_c %	σ_r cN/tex	ϵ_r %	
Reference PET	510.4	23.04	3.51	42.12	18.84	58.21	41.40	9.76
Treated PET at 500 W	500.2	22.36	3.77	43.80	20.03	55.20	37.53	9.32
Treated PET at 1000 W	486.6	20.11	4.03	47.25	22.19	51.00	32.76	8.78
Treated PET at 1500 W	423.5	17.42	5.65	51.06	25.04	47.20	27.67	8.68
Treated PET at 500 W	468.7	19.32	3.90	44.00	21.12	54.02	36.58	9.01
Treated PET at 1000 W	422.7	15.70	4.64	48.30	23.78	48.32	30.20	8.85
Treated PET at 1500 W	368.0	10.60	7.82	53.20	30.02	38.11	26.24	7.24

The fibers fineness decreases slightly with the plasma power, being stronger in air treatments.

Higroscopicity has been determined by conditioning and climatization; it increases with increasing the plasma power, which means a superficial degradation of the fibers by the formation of microbreaks constituting the retention medium of the water molecules.

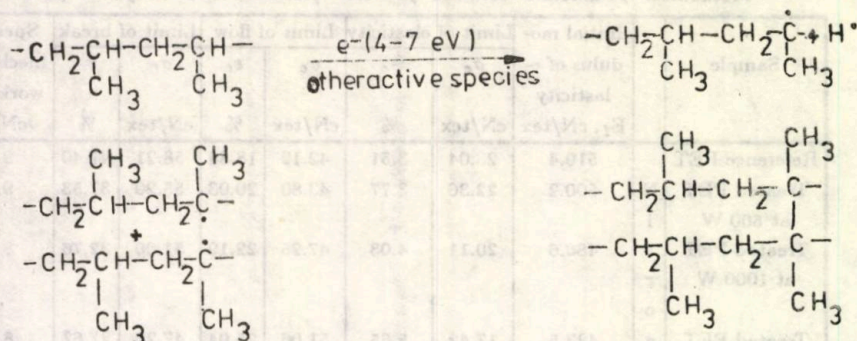
Comparison of the physical indices determined for the plasma-treated samples of the two categories of synthetic fibers, namely polypropylenic-carbocatenary- and polyester-heterocatenary- evidences certain suprastructural modifications, more pronounced with polyesteric fibers.

The mechanical parameters of the plasma-treated samples are slightly different from those of the reference sample. Decrease of the initial modulus with the increase of power is observed, even more pronounced with treatments in the air. The same tendency is to be observed, too, with the values of tenacity, while the relative elongations, corresponding to the limits, increase.

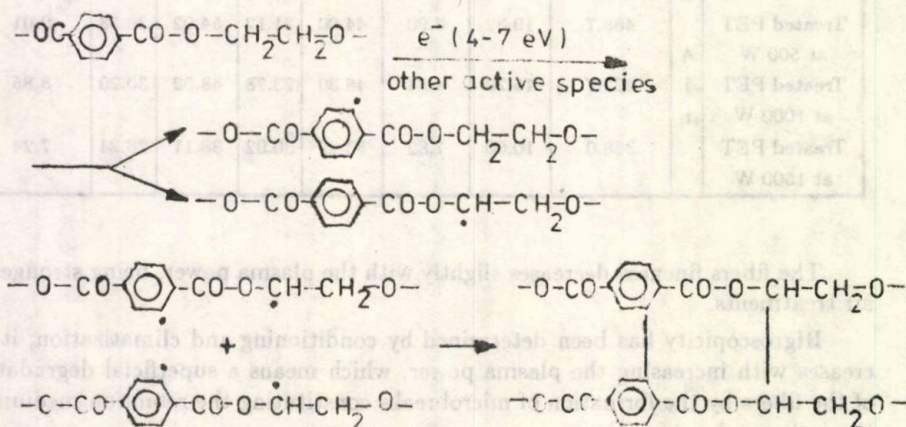
The experimental values obtained for both the physico-chemical and mechanorheological properties attest the installation of reticulation processes.

Taking into account the bonding energies of the chemical links within the two polymers, and the energy of the active species in the plasma, we proposed the following mechanisms of destruction, which agree with literature data:

- for polypropylene:



- for polyethylterephthalate:



Obviously, the mechanism is more complex, especially in the case of air plasma.

3. Conclusions. Isotactic polypropylenic fibers with high crystallinity are subjected to less pronounced degradation - under cold plasma conditions - than the polyesteric ones, being less susceptible to the action of plasma.

Experimental data obtained have evidenced that the number of active centers created is higher with polyesteric than with polypropylenic fibers.

The active centers created are short-life free radicals, being potential initiators of grafting reactions on fibers. Polyradicals generation depends on both the experimental conditions applied (pressure, gas nature, power) and the chemical and supramolecular structure of the support fibers.

The physico-chemical and mechano-rheological properties of the fibers are modified as a function of the treatments conditions, the quality of textile fibers remaining, nevertheless, unaffected. In order to get active centers on the treated

fibers, the plasma treatment should be conducted at moderate powers of the field and in an atmosphere of nitrogen (or other inert gas), for avoiding advanced processes of destruction.

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STUDIUL PROPRIETĂȚILOR FIZICO-CHIMICE ȘI MECANO-REOLOGICE ALE UNOR FIBRE SINTETICE MODIFICATE SUPERFICIAL PRIN METODE FIZICE NECONVENȚIONALE

(Rezumat)

Se prezintă un studiu privind proprietățile fizico-chimice și mecano-reologice ale fibrelor polipropilenice și poliesterice scurte, de aceeași finețe, supuse unor tratamente în plasma rece, la diferite puteri ale plasmă și în atmosferă de gaz inert și aer.

Sunt analizate degradările suferite de fibre și se propune mecanismul destrucției polimerilor constituenți ai fibrelor. Se explică modificările fibrelor tratate în plasmă prin parametri fizico-chimici și mecano-reologici.

OPTIMUM DU PROCESSUS DE FILAGE OE-ROTOR

PAR

M. CIOCOIU et DORIN AVRAM

1. Introduction. L'obtention des modèles mathématiques du processus de filage OE-ROTOR présentée dans l'ouvrage „Etablir le modèle du processus de filage OE“ [3] à constitué les prémises de ce travail dans lequel on présente une manière d'établir l'optimum du processus de filage OE.

2. Interpretation technologique des modèles mathématiques

2.1. Résistance à la rupture. Le modèle mathématique de la résistance à la rupture a la forme de la relation (1)

$$R = 349,83 - 1,68X_1 - 40,36X_2 - 11,49X_2^2 + 7,75X_1X_2 \quad (1)$$

Pour la réalisation de l'optimum on a passé la représentation graphique de l'équation (1) selon les indications [1,2], fig.1.

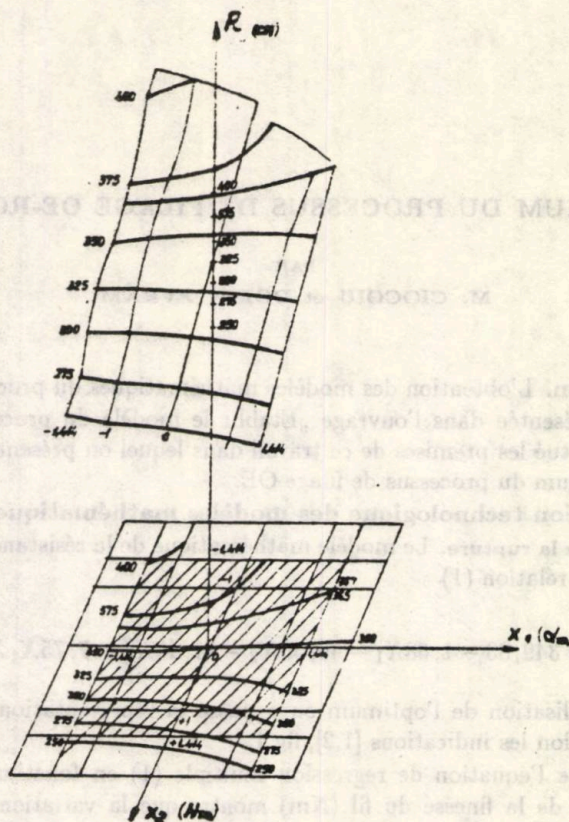
L'analyse de l'équation de regression multiple (1) en fonction du degré de torsion (α_m) et de la finesse du fil (Nm) montre que la variation vers les limites supérieures de la région expérimentale des variables indépendantes a sur les résultats une influence négative, ce qui concorde à la réalité technologique. En plus, cette influence est différente, à savoir, la finesse du fil (X_2) a une influence plus 24 fois sur la résistance à la rupture que le degré de torsion.

C'est l'expression dans le plan mathématique d'une réalité technologique ce qui montre encore une fois que la relation établie représente dans un mode adéquat le processus modélé.

La forme carré du modèle est représentée seulement de X_2^2 qui participe à l'amélioration de la forme de la surface dans le même sens avec le coefficient de X_2 indifféremment du sens de variation de celui-ci.

On observe aussi que la variation dans le même temps pour les deux paramètres influencera la variable dépendante environ 33,3% ce qui peut être appréciée comme réduite.

La surface de réponse (fig. 1) est dans la région expérimentale très étendue comme un plan doucement courbé vers les zones extrêmes de la région expérimentale. Il n'a pas un point d'extrême dans la région expérimentale. Dans le plan X_1X_2

Fig. 1.- Les graphiques $R = f(x_1, x_2)$

on peut suivre les courbes de résistance à la rupture constante entre les limites $275 \leq R < 400$ Cn.

La valeur maximale de la résistance à la rupture est obtenue dans la région $-1,414 < X_1 < 0,2$ c. à d. $128 < \alpha_m < 136$ et $-0,4 < X_2 < -1,414$ c. à d. $22 < Nm < 26$.

De l'analyse des courbes de contour de la surface de réponse on peut observer l'influence forte sur la résistance par la finesse du fil représentée par les courbes parallèles à l'axe $X_1(\alpha_m)$. Aussi, il est à souligner que dans la zone de centre, la courbe de 350 cN a des écarts très petits par rapport à l'axe $X_1(\alpha_m)$ ce qui montre que le fil Nm 27 peut être obtenu en utilisant tous les coefficients de torsion de la région expérimentale.

On peut donc réaliser le fil Nm 27 avec une torsion réduite ce qui influencera sur la productivité du métier, en connaissant le rôle important du degré de torsion dans le filage OE. Le choix de la valeur sera considéré optimal en fonction du

nombre de casses. Cette observation est valable pour les fils dans la gamme des fineses $Nm > 27$.

Pour les fils de la gamme $Nm < 27$ il y a une influence insignifiante de la torsion sur la résistance. Donc pour $Nm = 24$ et $\alpha_m = 135$ on obtient $R = 375$ cN, mais pour $\alpha_m = 142$ on obtient une résistance $R = 367$ cN, c. à d. une diminution de la résistance de 3%.

À la conception d'un fil on va tenir compte que le choix de la torsion sera faite en fonction surtout de nombre de casses.

2.2. Irrégularité Uster. L'équation de regression multiple qui représente la liaison analytique entre l'irrégularité et le degré de torsion (α_m) et la finesse du fil (Nm) est donnée par la relation (2).

$$U = 14,604 + 0,130X_1 - 0,0413X_2 + 0,1098X_1^2 + 0,1598X_2^2 + 0,125X_1X_2 \quad (2)$$

De l'analyse du modèle mathématique on observe que la correction que l'apportent les termes lineaires est de sens contraire et de poids différentes.

De cette manière le coefficient de $X_1(\alpha_m)$ est d'environ 3,29 fois plus grand que le coefficient de $X_2(Nm)$.

L'augmentation de $X_1(\alpha_m)$ a une influence négative sur l'irrégularité et dans le même temps la diminution de $X_2(Nm)$ demande une amélioration de l'irrégularité, ce qui consiste une réalité technologique.

Il faut remarquer que la valeur de l'interaction X_1X_2 a le même sens et la valeur approchée des termes carrés.

La surface de réponse (fig.2) est un paraboloïde elliptique à point minimum $X_1 = 0,774$ ($\alpha_m = 138,87$) et $X_2 = 0,273$ ($Nm = 27,81$) pour lequel on obtient $U = 14,65\%$.

De l'analyse du graphique on observe que la région expérimentale est croisée seulement de courbes de niveau constant $U = 14,75\%$ et $U = 15\%$ ce qui est en concordance avec une observation similaire faite à l'analyse du modèle de la résistance à la rupture.

Dans la gamme des fils analysés la variation de la valeur de l'irrégularité n'est pas influencée de torsion que dans des limites très étroites.

Ainsi la variation de $\alpha_m = 128$ à $\alpha_m = 138$, l'irrégularité a une variation minimale. Pour la gamme $\alpha_m = 138$ à $\alpha_m = 142$ l'irrégularité augmente seulement 2%. La même observation on peut la faire, aussi pour l'influence de la variation de la finesse sur l'irrégularité pour la région analysée. Pour le même degré de torsion, l'augmentation de la finesse du fil n'influence pas la valeur de l'irrégularité significativement, puisque pour les fils plus fins, il faut augmenter la torsion, ce qui déterminera un doublage plus élevé à l'intérieur du rotor, en uniformisant la couche de fibres.

3. Conclusions. Les modèles mathématiques permettent d'établir le degré d'influence des paramètres technologique sur les variables dépendantes.

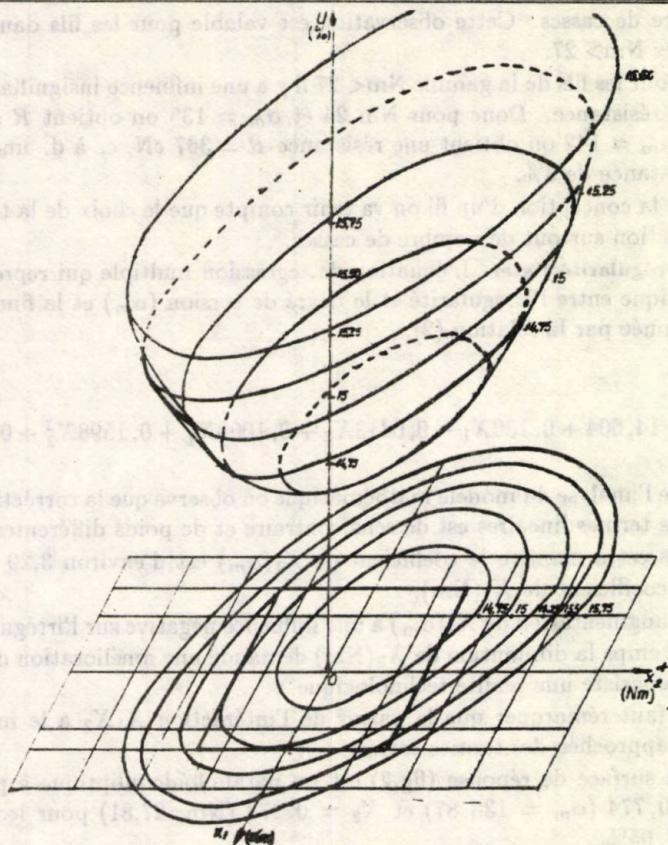


Fig. 2.- Les graphiques $U = f(x_1, x_2)$.

Les équations de regression multiple permettent aussi d'établir les valeurs optimales des paramètres technologiques.

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OPTIMIZAREA PROCESULUI DE FILARE OE-ROTOR

(Rezumat)

Se prezintă modelele matematice pentru rezistența la rupere și neregularitate, la fire obținute pe mașina de filat cu rotor, funcție de gradul de torsionare și finețe.

ÉTUDES CONCERNANT L'INFLUENCE DE LA TECHNOLOGIE SUR LES CARACTÉRISTIQUES DES FIBRES TYPE LAINE

PAR

DORIN AVRAM et GH. FLOREA

1. Introduction. Les caractéristiques des fils sont le résultat de la manière dans laquelle sont transférées les caractéristiques des fibres.

Le transfert dépend de caractéristiques des fibres (finesse, longueur, coefficient de friction fibre-fibre, etc.) et de structure du fil.

L'appréciation de la façon de transfert des caractéristiques est faite par l'indice de transfert ou coefficient d'utilisation.

Dans l'activité de conception des fils est nécessaire de connaître les moyennes des caractéristiques des fibres et du mélange et aussi les indices de transfert pour prévoir les caractéristiques moyennes des fils.

Dans la technologie de transformation des fibres de laine et type laine en fil, elles sont soumises aux différents efforts et traitements chimiques, qui ont une influence sur les caractéristiques et de la manière de comportement dans la structure du fil.

Le travail s'occupe d'étudier les caractéristiques des fibres en différentes phases de fabrication pour mettre en évidence l'influence de la technologie sur les fibres et les indices d'utilisation.

2. Partie expérimentale. Les essais ont été faits sur les fibres de laine et polyester type laine peignée dans la phase du mélange et du fil. Les fibres de laine ont été teintées en noir et les fibres de polyester blanches. Le mélange a été 70% PES + 30% WO et la finesse du fil Nm48.

Les fibres ont été analysées du point de vue de la résistance à la rupture, de l'allongement à la rupture, de la résistance spécifique et de la longueur. Les essais ont été faits selon STAS 8520-87 pour la résistance si l'allongement et STAS 7638-66 pour la longueur.

Pour chaque variante on a calculé les paramètres statistiques (moyenne, écart-type et coefficient de variation) et aussi les modifications des caractéristiques moyennes des fibres du fil par rapport à la phase de mélange.

Les résultats obtenus pour les paramètres statistiques sont présentés dans le tableau 1 et la modification des caractéristiques moyennes des fibres dans le tableau 2.

Tableau 1

Caractéristique	Type de la fibre	Phase technologique	Paramètres statistiques		
			moyenne	écart-type	coefficient de variation (%)
résistance à la rupture (cN)	laine	ruban	10.014	3.53	35.26
	laine	fil	8.75	3.19	36.49
	PES	ruban	22.05	3.93	17.85
	PES	fil	21.08	3.3	15.67
	M	ruban	18.86	6.54	34.7
	M	fil	17.82	6.32	35.61
allongement à la rupture (%)	laine	ruban	14.98	8.9	59.73
	laine	fil	13.57	6.45	47.53
	PES	ruban	16.24	4.83	29.79
	PES	fil	15.68	3.43	21.93
	M	ruban	15.88	6.203	39.06
	M	fil	15.12	4.53	29.96
longueur (mm)	laine	ruban	66.71	17.50	26.21
	laine	fil	58.11	18.57	31.95
	PES	ruban	79.15	8.79	11.12
	PES	fil	78.29	9.43	12.06
	M	ruban	74.62	13.01	17.44
	M	fil	70.94	15.48	21.83
résistance spécifique (cN/tex)	laine	ruban	12.65	—	—
	laine	fil	11.056	—	—
	PES	ruban	45	—	—
	PES	fil	43.015	—	—
	M	ruban	26.5	—	—
	M	fil	25.03	—	—

M – mélange (70% PES + 30% laine)

Pour le fil obtenu (Nm 48) on a déterminé la résistance à la rupture, la résistance spécifique, l'allongement à la rupture et les coefficients d'utilisation de la résistance des fibres dans la résistance du fil et l'allongement des fibres dans l'allongement du fil.

Les résultats sont présentés dans le tableau 3.

3. Conclusions. De l'analyse des résultats on constate que les valeurs moyennes des caractéristiques des fibres étudiées baissent le long du processus de fabrication. Les fibres de laine sont plus influencées que les fibres de polyester (tableau 2). On peut expliquer cela par le fait que les fibres de laine peignée sont plus fragiles et elles sont plus fatiguées par le traitement auquel ont été soumises le long du processus de fabrication, en partant du triage jusqu'au filage.

En ce qui concerne le coefficient de variation (tableau 1) pour les caractéristiques on ne peut pas constater une variation dans un certain sens, mais il y a des

Tableau 2

Caractéristique	Type de la fibre	Valeurs moyennes		Modification de la valeur moyenne (%)
		Ruban	Fil	
résistance à la rupture (cN)	laine	10.014	8.75	12.62
	PES	22.05	21.08	4.39
	M	18.86	17.82	5.51
allongement à la rupture (%)	laine	14.91	13.57	8.97
	PES	16.24	15.68	3.45
	M	15.88	15.12	4.79
résistance spécifique (cN/tex)	laine	12.65	11.056	12.6
	PES	45	43.015	5.55
	M	26.5	25.03	4.79
longueur (mm)	laine	66.71	58.11	12.89
	PES	79.15	78.29	1.09
	M	74.62	70.94	4.92

M - mélange (70% PES + 30% laine)

Tableau 3

Caractéristique	Valeurs pour Nm48 (70% PES + 30% laine)
résistance à la rupture (cN)	321.08
résistance spécifique (cN/tex)	15.41
allongement à la rupture (%)	14.03
coefficient d'utilisation de la résistance des fibres dans la résistance du fil:	
- pour les fibres du ruban	$15.41/26.5=0.58$
- pour les fibres du fil	$15.41/25.03=0.62$
coefficient d'utilisation de l'allongement des fibres dans l'allongement du fil:	
- pour les fibres du ruban	$14.03/15.88=0.88$
- pour les fibres du fil	$14.03/15.12=0.92$

valeurs plus grandes pour les fibres de laine par rapport aux fibres de polyester.

Les coefficients d'utilisation ont des valeurs plus grandes pour les fibres du fil, ce qui veut dire que les caractéristiques des fibres sont mieux utilisées par la structure du fil.

Donc, pour augmenter la résistance et l'allongement des fils il faut maintenir les caractéristiques des fibres le long du processus de fabrication.

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STUDII PRIVIND INFLUENȚA TEHNOLOGIEI ASUPRA CARACTERISTICILOR FIBRELOR TIP LÂNĂ

(Rezumat)

Lucrarea tratează aspecte privind modul de variație a caracteristicilor fibrelor de lână și polyester pe parcursul fluxului tehnologic și implicația lor în caracteristicile firelor.

Caracteristică	Valoare medie	Valoare medie	Valoare medie
1. Lungimea medie (mm)	100	100	100
2. Diametrul (μm)	15	15	15
3. Modulul de elasticitate (N/tex)	100	100	100
4. Coeficientul de contracție (%)	10	10	10
5. Coeficientul de dilatare (%)	10	10	10
6. Coeficientul de rezistență (%)	10	10	10
7. Coeficientul de rezistență (%)	10	10	10
8. Coeficientul de rezistență (%)	10	10	10
9. Coeficientul de rezistență (%)	10	10	10
10. Coeficientul de rezistență (%)	10	10	10

Caracteristică	Valoare medie	Valoare medie	Valoare medie
1. Lungimea medie (mm)	100	100	100
2. Diametrul (μm)	15	15	15
3. Modulul de elasticitate (N/tex)	100	100	100
4. Coeficientul de contracție (%)	10	10	10
5. Coeficientul de dilatare (%)	10	10	10
6. Coeficientul de rezistență (%)	10	10	10
7. Coeficientul de rezistență (%)	10	10	10
8. Coeficientul de rezistență (%)	10	10	10
9. Coeficientul de rezistență (%)	10	10	10
10. Coeficientul de rezistență (%)	10	10	10

ÉTUDES CONCERNANT L'OBTENTION DES FILS A FIBRES COLLÉES DU LIN BLANCHI

PAR

ADRIANA MUSTAȚĂ et DORIN AVRAM

1. Introduction. La qualité de la matière et la technologie utilisée en vue de la transformation des fibres en fil influence sur les caractéristiques des produits et leur destination.

Dans l'effort de valorisation supérieure des propriétés naturelles des fibres libériennes un rôle remarquable dans l'élimination des incrustations de la fibre est d'augmenter le degré d'individualisation pour l'obtention de fils fins à l'étirage mouillé.

La nécessité de la réalisation pour l'obtention des fils fins à un degré grand de recouvrement, à une perméabilité à l'air augmentée, même dans les condition de la filage mouillée du lin, a déterminé la recherche des solutions nouvelles qui peuvent réaliser le transfert des caractéristiques des fibres dans celles du fil.

Une solution déterminée pour l'obtention d'une telle structure dans le même temps avec une résistance suffisante donnée par la stabilité de la position de la fibre, c'est l'utilisation de la fausse torsion. Dans ce travail on a suivi l'application de la fausse torsion dans la filage mouillée du lin non-rouissage et l'obtention des fils avec une nouvelle structure.

L'application de la fausse torsion d'après l'étirage dans l'état mouillé des fibres de lin assure l'obtention d'une structure différente par rapport aux fils classiques.

Le nombre de fibres fixées dans les fils par l'application de la fausse torsion n'assurent pas les caractéristiques mécaniques nécessaires pour un bon comportement dans les processus suivants.

La fixation d'un nombre plus grand de fibres dans la section du fil de lin obtenu par la fausse torsion d'après l'étirage dans l'état mouillé, apparait comme possible par l'application d'un processus de séchage partiel du faisceau de fibres. Par le séchage partiel du fil tout-de-suite d'après l'étirage mouillé et la mise en torsion fausse on suive le regroupement des substances de cimentation du gel sur les fibres élémentaire, des substances qui vont contribuer à la fixation des fibres dans le fil.

2. Partie expérimentale. Les essais ont été faits sur une installation en utilisant pour le train d'étirage les paramètres:

– l'écartement 150 mm;

- l'espace critique 30 mm;

- l'étirage 12; 16,8.

Pour le dispositif de fausse torsion on a travaillé avec les suivants paramètres:

- nombre de tours 3000 t/min;

- fausse torsion 300 t/m.

On a utilisé une mèche Nm 0,93 des fibres de lin blanchi.

Les valeurs moyennes pour les principales caractéristiques des fils réalisées par le nouveau système de filage, comparées aux valeurs imposées par STAS 1717/1989 pour les mêmes fils obtenus par le système classique de filage mouillée sont présentées dans le tableau 1.

Tableau 1

Caractéristiques	Fils à la torsion réelle STAS 1717/1989		Fils à la torsion fausse	
Densité linéaire, T_{tex}	84	64	86,2	60
Nm	12	16	11,5	16,5
qualité				
Résistance E	1670	1250		
à la I	1400	1020	967	897
rupture, cN II	1170	875		
Irrégularité de la résistance à la rupture, %	16	16	15,2	16,7
Allongement à la rupture, %	3	3	2,2	2,5
Résistance spécifique, cN/tex	13,92	13,67	13,00	13,11

3. Conclusions. Par le nouveau système de filage on a obtenu du lin non-rouissage blanchi des fils avec une nouvelle structure, où les fibres sont mises parallèlement à l'axe du faisceau. La résistance moins élevée les recommandent pour les structures de tissus destinées pour l'habillement et le linge de maison obtenu sur le métier à tisser nonconventionnel.

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STUDII PRIVIND OBTINEREA FIRELOR CU FIBRE LIPITE DIN IN ALBIT

(Rezumat)

Se prezintă o structură nouă de fir obținută printr-un procedeu neconvențional. De asemenea, se compară caracteristicile firelor astfel obținute cu firele realizate pe sistemele clasice din aceeași materie primă. Se indică domeniile de utilizare a firelor.

RECHNERGESTÜTZTE PROJEKTIERUNG DER BINDUNGEN FÜR EINFACHE GEWEBESTRUKTUREN. ELEMENTE MATHEMATISCHER MODELLIERUNG

VON

DANIEL CHINCIU, GEORGE CIUBOTARU
und GABRIEL CORNELIU CHINCIU

1. Einleitung. Die Rechnergestützte Projektierung und Konstruktion der Bindungen für Gewebe erfordert die Ausarbeitung von Programmen mit deren Hilfe Bindungen für alle Arten von gewebten Strukturen gebildet werden können, so wie auch Schaffung der Wahl für die Diversifizierung der Zeichnungen/Modelle, die die Möglichkeiten der klassischen Methoden übertreffen sollen. Der Zweck dieser Arbeit ist die bestehenden mathematischen Modelle kurz zu präsentieren, bezüglich der Beschreibung der Bindungen, so wie auch die Präsentation eines neuen Modells, auf dessen Grundlage ein komplexes Programm geschaffen wurde, das die Möglichkeit bietet alle Abarten von Bindungen für einfache Gewebe aufzubauen.

2. Theorien betreffs Anwendung der Analytischen Geometrie die Beschreibung der Bindungen. Aus der Fachliteratur ist es ersichtlich, daß Interesse existiert hat und für die Beschreibung der Gewebefindungen auf mathematischer Grundlage; außer der wissenschaftlichen Begründung und der Forschung werden aber keine Elemente geboten für die Ausarbeitung von Algorithmen auf deren Grundlage Programme für die rechnergestützte Projektierung der Gewebefindungen geschaffen werden können.

In dieser Hinsicht sind anzuführen die Arbeiten von Prof. N.P. Langowoi, der die Theorie der Mantellinie für das Studium der Grundbindungen geschaffen hat, so wie das Buch von M.N. Nikitin „Theorie der Gewebefindungen auf mathematischer Grundlage“.

Die Theorie der Mantellinie geht davon aus, daß die Lage der Bildepunkte in den Grundbindungen durch die Kreuzung zweier Systeme von parallelen Mantellinien bestimmt wird. Jedes Mantelliniensystem wird von zwei Koordinaten bezüglich eines Bindepunktes bestimmt, der unten links liegt (x, y) und von anderen zwei Koordinaten bezüglich eines Bindepunktes, der unten rechts liegt (x_1, y_1) , entsprechend der Abb. 1, wo die Pfeile andeuten die Richtungen in welchen diese Größen als wachsend angesehen werden. Auf dieser Grundlage kann der Bindungsrapport berechnet werden als Summe der Produkte der entgegengesetzten Parameter: $x \cdot y_1 + x_1 \cdot y = R$. Im Falle der in Betracht genommenen Atlasbindungen: $1 \cdot 1 + 4 \cdot 2 = 9$.

M.N. Nikitin [1] benützt die Angaben der analytischen Geometrie zum Studium der Gewebestrukturen; er beschreibt die Bindungen durch die Gleichung

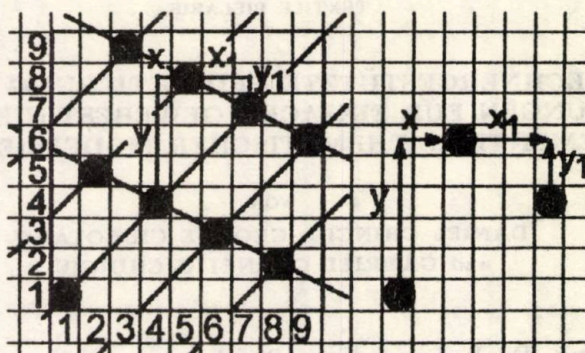


Abb. 1

einer Geraden oder durch ein System von Geraden: $y = a \cdot x + b$, wobei a der Richtungskoeffizient ist und gleichen Wert hat wie die Verrückung des Bindepunktes und b die Entfernung bei der der Bindepunkt beginnt gegenüber des Ursprungs des Koordinatensystems.

Die Atlasbindung A 9/2 von Abb. 2 hat die Gleichung: $y_9 = 2 \cdot x$. Die Zahl 9 gibt die Größe des Bindungsrapports an, während 2 die Verrückung der Bindepunkte angibt. Im Falle daß $2 \cdot x > R$, dann wird die Gleichung der Geraden $y_9 = 2 \cdot x - R$. Wenn $x = 5$, ergibt sich $y_9 = 2 \cdot 5 - 9 = 1$. Dies stellt die Rückung der Bindepunkte in den Rahmen des Bindungsrapports R dar.

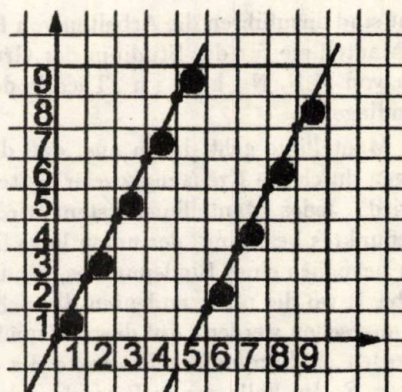


Abb. 2

Prof. A. Marchis [2] gibt der Geraden, auf der die Bindepunkte in einer Gewebestruktur liegen, eine komplexere Form: $y = a \cdot x + k \cdot R + c$. Die Bindung wird in einem rechtwinkligen Achsensystem angesehen, das den Ursprung hat in einem Punkt $A(0,0)$, Abb. 3. So wird die zahlenmäßige Übereinstimmung gesichert zwischen den Koordinaten die einen beliebigen Bindepunkt im Bindungsrapport bestimmen und der Ordnungszahl der Kett- und Schußfäden die diesem Punkt entsprechen. Folglich wird der Bindungsrapport ein Feld $x, y(1, R)$.

Die Bindepunkte mit Ketteffekt werden in der graphischen Darstellung durch Zahlen dargestellt, die die Ordnungszahl der Gerden angeben, der sie gehören, während die Ordnung der Geraden bestimmt wird durch die wachsende Größe der freien Summanden der Gleichungen die durch zwei Zahlen dargestellt werden, $K \cdot R + C$, wobei R der Bindungsrapport ist und $C \in (0, R - 1)$.

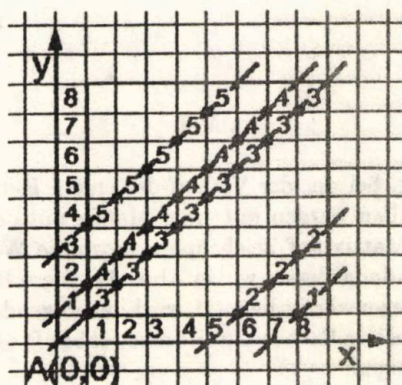


Abb. 3

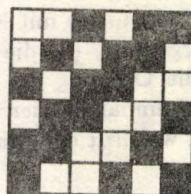
Als Schlußfolgerung kann geschätzt werden, daß die Methoden zur Beschreibung der Gewebebindung lineare Gleichungen benutzen einen wissenschaftlichen Fortschritt darstellen, aber keine von ihnen kann die Grundlage bilden für einen Algorithmus, der dienen könnte für den Entwurf und Realisierung von Rechnerprogrammen.

3. Matrizendarstellung der Gewebebindungen. Die Beschreibung der Bindungen mit den Methoden der analytischen Geometrie haben nicht benutzt werden in der Programmierung der Bindungen mittels Rechner. Es wurden nun andere Mittel ergriffen um die Bindungen zu beschreiben, die Möglichkeit bieten für den elektronischen Rechner. So ist die Beschreibung der Bindung als Matrix erschienen, wobei die Anzahl der Spalten dem Rapport in Kettrichtung entspricht (RK) und die Anzahl der Zeilen dem Rapport in Schußrichtung (RS). Die Kreuzungen zwischen ihnen stellen die Bindepunkte dar oder die Elemente der Matrix, die mit

1 notiert werden für die Bindepunkte mit Ketteffekt und 0 für die Bindepunkte mit Schußeffekt (Abb. 4a, 4b).

$$A = \begin{pmatrix} 0 & 0 & 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 & 1 \end{pmatrix}$$

a)



b)

Abb. 4

Eine Körperbindung, bei der der Verlauf des ersten Kettfadens $\frac{2}{1} \frac{1}{2}$ ist und $S_u = +1$, kann beschrieben werden mit einer Matrix mit der Form aus Abb. 4a. Die Darstellung dieser Matrix auf Zeichenpapier, wo die Werte 1 volle Quadrate bilden, führt zu dem Bindungsdessin wie in Abb. 4b. Diese Rechenmethode für die Gewebefbindungen die gegenwärtig benutzt wird hat folgende Nachteile:

- Sie benötigt komplizierte Rechenalgorithmen, daher Programme die schwierige Ausarbeitung benötigen;
- Keine Möglichkeit Methoden anzuwenden für Ableitungen, wie z.B. Drehungen, Negativierungen usw.

4. Vektorielle Beschreibung der Gewebefbindungen. Die Grundlage der Beschreibung der Bindungen durch Darstellung der Bindepunkte als vektorielle Größen bildet die Theorie der Grundbindungen von Prof. S.A. G a n e s c h i n. Er definiert die Grundbindungen auf der Basis von zwei Parametern, der Rapport R und die Verrückung S_u (in Kettrichtung) und S_b (in Schußrichtung). Je nach ihrem Wert, werden drei Grundbindungen unterschieden: Leinwand, Körper und Atlas. Die Verteilung der Bindepunkte im Felde der Bindung geschieht nach festen Regeln, die durch den Wert der Verrückung (S) gekennzeichnet werden. Wenn durch S_z die veränderliche Verrückung des Bindepunktes von einem Kettfaden im Vergleich zum Bindepunkt vom ersten Faden notiert wird durch S_u die konstante Verrückung zwischen den Bindepunkten von zwei aufeinanderfolgenden Kettfäden, mit k die Zahl des Fadens vor dem in Betracht gezogenen, dann ist die Funktion zwischen S und R folgende $S_{k+1} = k \cdot S_u - m \cdot R$. Dabei ist k die anzahl der Fäden die dem in Betracht gezogenen vorangehen $m \in \mathbb{N}^*$, so daß $k \cdot S_u - m \cdot R < R$. Aus der Analyse dieser Funktion geht hervor daß auf dem Schußfaden (1) der nächste Bindepunkt mit Kettfaden $R+1$ ist; daher die Regelmäßigkeit der Bindungen. Die

vektorielle Darstellung führt zu Lösungen die in einem System der Beschreibung der Gewebearbindungen angewandt werden können; das führt zu Algorithmen die leicht für den Aufbau von rechnergestützten Bindungen programmiert werden.

5. Eine neue Darstellung der Bindungen für Projektierung und rechnergestütztem Aufbau. Die Bindung mit gleichförmiger Verteilung der Bindepunkte kann bestimmt werden, wenn der Verlauf des ersten Kettfadens und der Algorithmus der Ordnung von Schuß- und Kettfäden bekannt ist. Die Atlasbindungen A5/3 (Abb. 5) kann definiert werden durch folgende Elemente:

- Der Verlauf des ersten Kettfadens $k = (1, 0, 0, 0, 0)$ oder $k = 1/4$;
- Der Algorithmus für die Berechnung der Reihenfolge der Kettfäden: $U_i = U_{i-1} + Su, \text{ mod } Ru, i=2 \dots Ru$. Wenn $U_i > Ru$, dann ist: $U_i = (U_{i-1} + Su) - Ru$. $Ru = \sum K_i$, daß heißt $R = 1 + 4 = 5$;
- Der Algorithmus für die Berechnung der Reihenfolge der Schußfäden: $B_i = B_{i-1} + Sb, \text{ mod } Rb, i=2 \dots Rb$. Wenn $B_i > Rb$, dann ist: $B_i = (B_{i-1} + Sb) - Rb$.

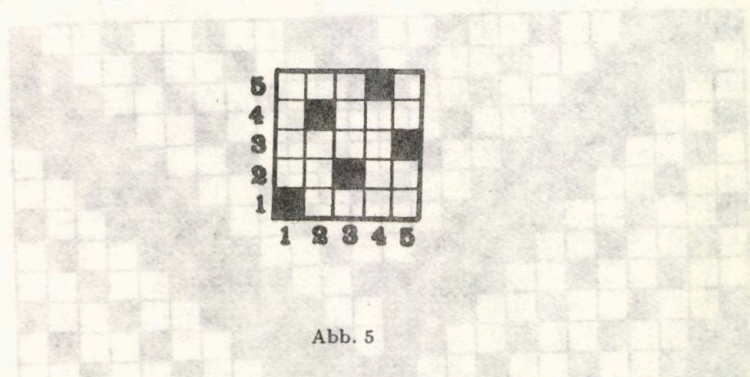
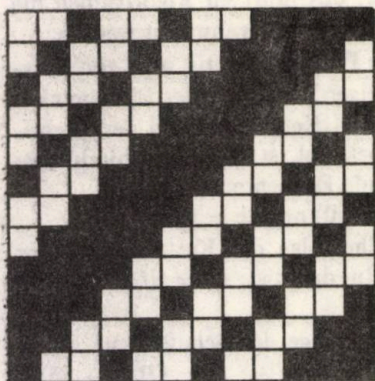


Abb. 5

Diese Art der Projektierung der Gewebearbindungen gestattet eine sehr flexible-mathematische Programmierung am Rechner, so daß jede Position des Kett- oder Schußfadens direkt berechnet wird. Es können auch Bindungen mit großen oder sehr großen Mustern projiziert werden, mit einer reduzierter Anzahl von Schäften. Es werden besondere Kombinationen erhalten, nur durch Einordnung der Kett- und Schußvektoren, indem verschiedene Algorithmen benutzt werden. Es folgt daraus daß jeder Untergruppe von Bindungen ein bestimmter Algorithmus entspricht für den Vektor der die Ordnung der Kettfäden enthält und für den Vektor der die Ordnung der Schußfäden erhält. Die vorgeschlagene Projektierungsmethode ist besonders zweckmäßig für die Diversifizierung der Bindungen, durch Drehung. Drehung und Negativierung, Vervielfältigung usw., was mit anderen Methode nicht erzielt werden kann [3, 4, 5, 6].

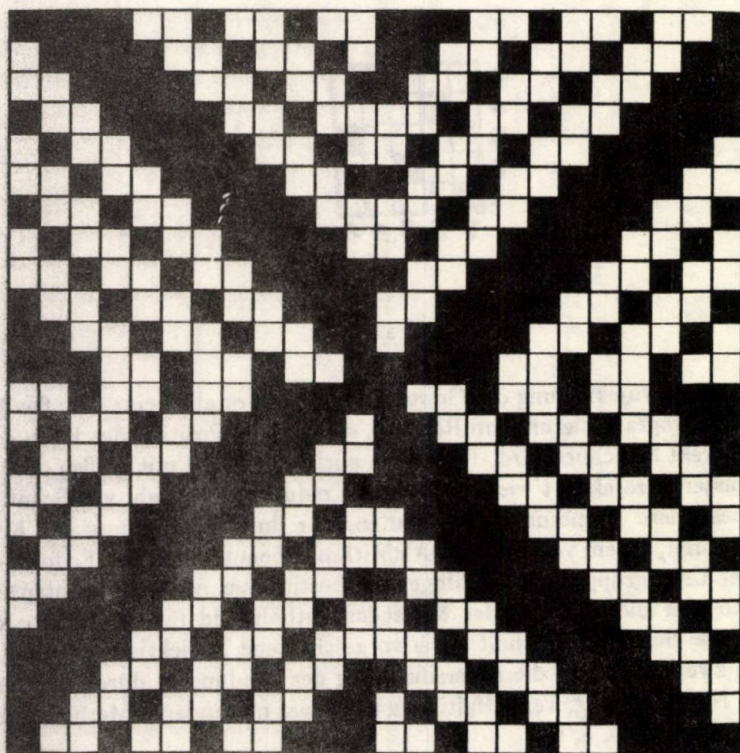
6. Anwendungen. Aus dem Verlauf des ersten Kettfadens $K=(111100100100)$, Abb. 6a kann die Bindung von Abb. 6b erhalten werden, in der die Zeichnung von



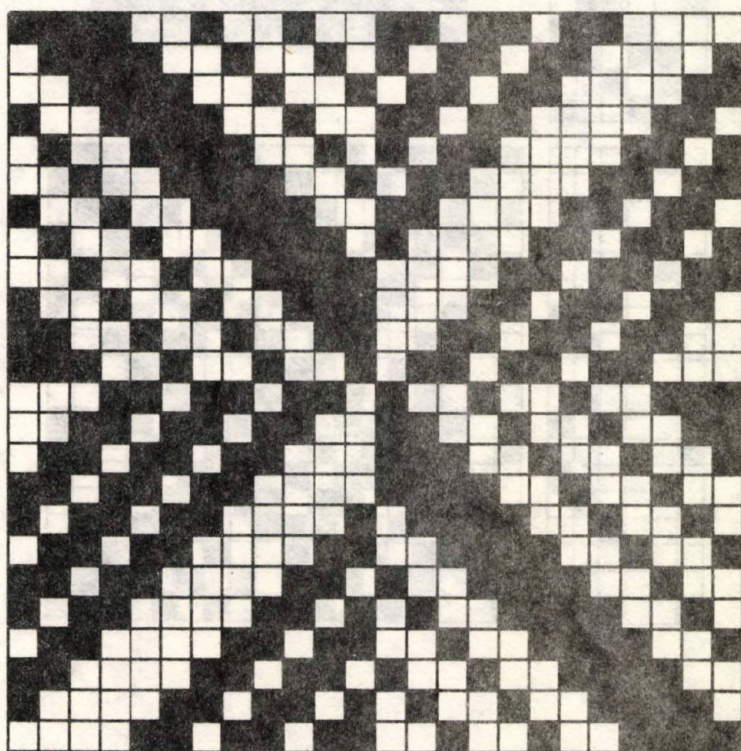
a)



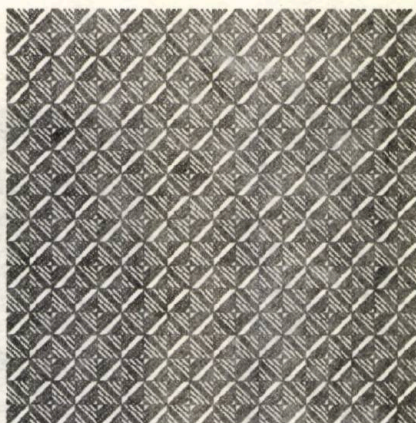
c)



b)



a)



b)

Abb. 7

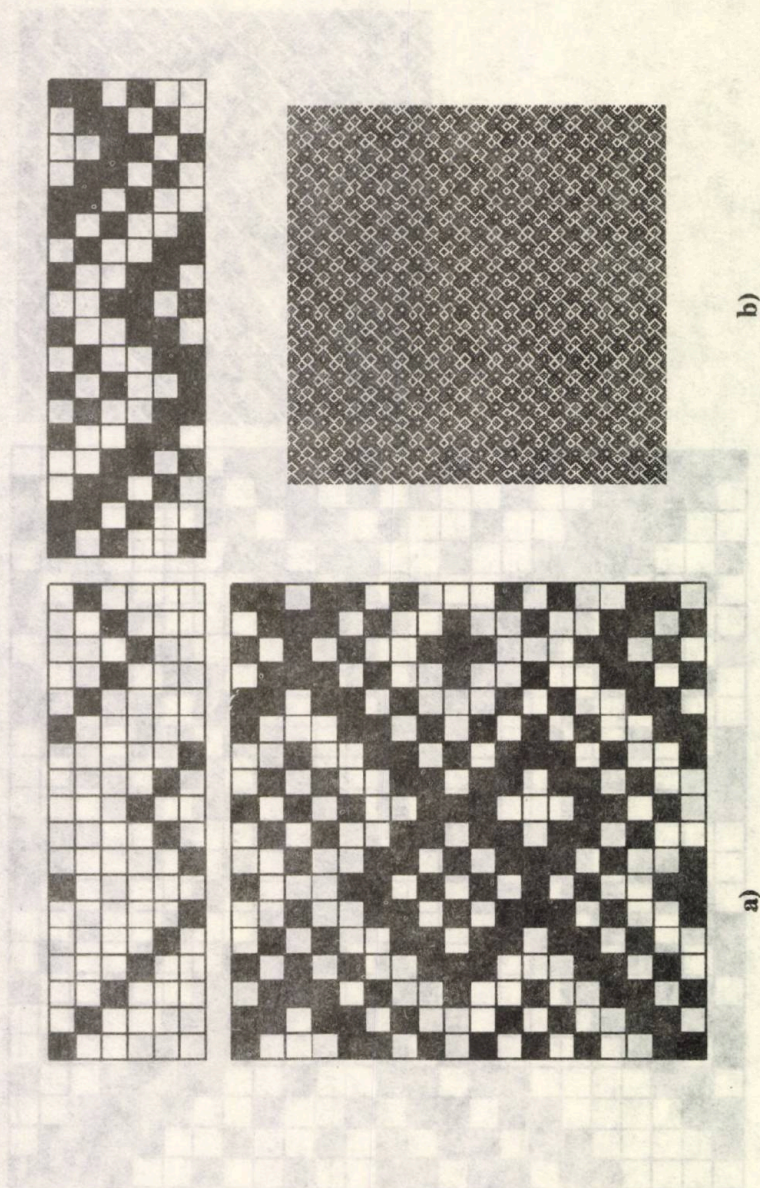


Abb. 8

Sektor 1 mit 90° in Uhrzeigersinn gedreht wird, in den anderen drei Sektoren. Das wird erwirkt durch einen Algorithmus in dem der Vektor des Verlaufes des ersten Fadens in umgekehrter Reihenfolge in den aufeinanderfolgenden Sektoren geschrieben wird. In Abb. 7 ist ein Bindungsmuster mit demselben Verlauf des ersten Fadens dargestellt, wo ein Algorithmus angewandt wurde für den Vektor U_i , so daß gleichzeitig mit der Drehung auch die Negativierung in den vier Sektoren geschieht. In Abb. 8 wird darstellt eine Bindung die erzielt wird durch Kombination einer spitzen progressiven Körperbindung die als Grundlage hat den Verlauf des ersten Fadens, angegeben durch Vektor $K=(110010)$ und $n_u = 9$, $n_b = 10$, $Ru = 2 \cdot n_u - 2$, $Ru = 2 \cdot 9 - 2 = 16$, $Rb = 2 \cdot n_b - 2$, $Rb = 2 \cdot 10 - 2 = 18$.

7. Schlußfolgerungen. Es wurde einige Möglichkeiten präsentiert für den Aufbau der Gewebefbindungen mit Anwendung des elektronischen Rechners. Die Diversifizierung der Bindungssdessins, die erzielt werden kann, ist praktisch unbegrenzt. Das präsetierte Programm ist grundsätzlich dadurch gekennzeichnet, daß neue Muster geschaffen werden können, auf der Grundlage von Optionen, wobei ein Minimum an Ausgangsdaten notwendig ist. Dies stellt den originellen Charakter des Programms dar, das es von allen anderen Erungenschaften in diesem Bereich unterscheidet.

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PROIECTAREA ASISTATĂ DE CALCULATOR A LEGĂTURILOR PENTRU STRUCTURI ȚESUTE SIMPLE. ELEMENTE DE MODELARE MATEMATICĂ

(Rezumat)

Lucrarea prezintă modelele matematice existente cu privire la descrierea legăturilor, precum și prezentarea unui model nou pe baza căruia a fost realizat un produs program complex capabil să construiască toate variantele de legături pentru țesături simple.

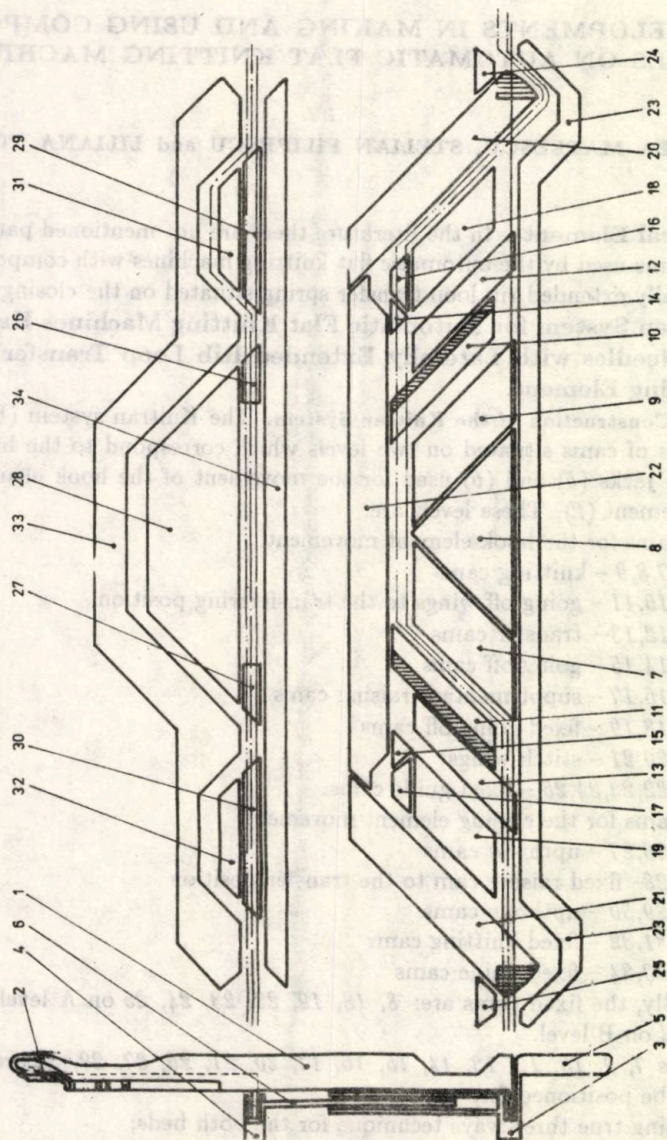


Fig. 1 a

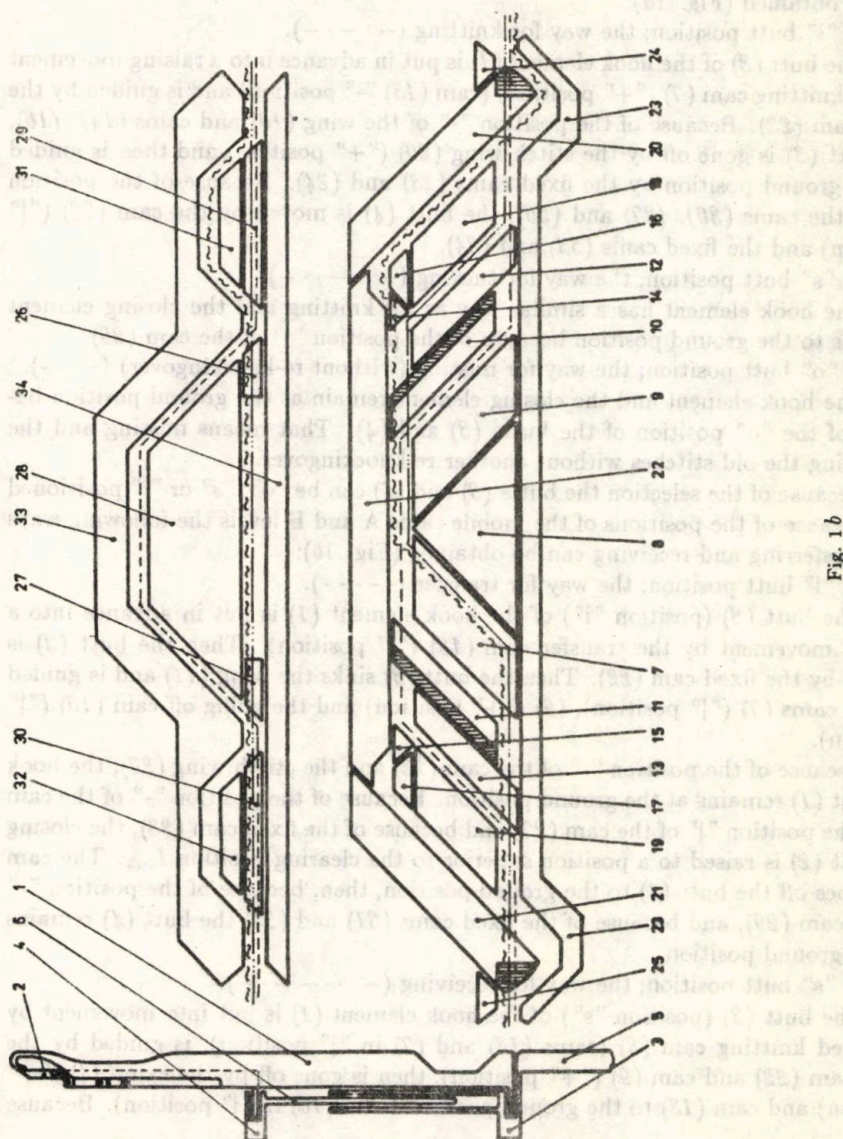


Fig. 1b

- transfer from the back to the front bed or vice-versa (transfer and receiving on the both beds) without knitting;
- transfer and knitting on the receiving needles.

2.2. The Analysis of the Technological Possibilities. Figs. 1a and 1b show the technological possibilities at the carriage travel from the right to the left.

Because of the selection, the butts (3) and (4) can be "o", "s" or "i" positioned, and because the positions of the mobile cams A and B levels three ways for knitting can be obtained (Fig. 1a):

a) "i" butt position; the way for knitting (— · — · —).

The butt (3) of the hook element (1) is put in advance into a raising movement by the knitting cam (7) ("+" position) (cam (13) "-" position) and is guided by the fixed cam (22). Because of the position "-" of the wing (10) and cams (14), (16), the butt (3) is gone off by the stitch wing (20) ("+" position) and then is guided at the ground position by the fixed cams (23) and (24). Because of the position "-" of the cams (30), (27) and (26), the butt (4) is moved by the cam (29) ("|" position) and the fixed cams (33) and (34).

b) "s" butt position; the way for tucking (— · — · — · —).

The hook element has a similar way as for knitting and the closing element remains to the ground position because of the position "|" of the cam (29).

c) "o" butt position; the way for missing (without re-knockingover) (——).

The hook element and the closing element remain at the ground position because of the "o" position of the butts (3) and (4). That means missing and the stretching the old stitches without another re-knockingover.

Because of the selection the butts (3) and (4) can be "o", "s" or "i" positioned and because of the positions of the mobile cams A and B levels the following ways for transferring and receiving can be obtained (Fig. 1b):

d) "i" butt position; the way for transfer (— — — —).

The butt (3) (position "i") of the hook element (1) is put in advance into a raising movement by the transfer cam (13) ("|" position). Then the butt (3) is guided by the fixed cam (22). Then the butt (3) sinks the wing (11) and is guided by the cams (7) ("|" position), (9) ("+" position) and the going off cam (10) ("|" position).

Because of the position "-" of the cam (12) and the stitch wing (20), the hook element (1) remains at the ground position. Because of the position "-" of the cam (30), the position "|" of the cam (27) and because of the fixed cam (28), the closing element (2) is raised to a position superior to the clearing position $I_{+\Delta}$. The cam (33) goes off the butt (4) to the ground position, then, because of the position "-" of the cam (29), and because of the fixed cams (31) and (34) the butt (4) remains to the ground position.

e) "s" butt position; the way for receiving (— · — · — · —).

The butt (3) (position "s") of the hook element (1) is put into movement by the fixed knitting cam (8) (cams (13) and (7) in "|" position), is guided by the fixed cam (22) and cam (9) ("+" position), then is gone off by the cam (14) ("+" position) and cam (18) to the ground position (cam (10) in "|" position). Because

the position "-" of the cam (20), the butt (3) is guided at the ground position by the fixed cams (23) and (24).

Because of the position "-" of the cam (30), the position "|" of the cams (27) and (26), the position "-" of the cam (29) the closing element (2) remains at the ground position.

f) "o" butt position; the way for missing without re-knockingover (—).

The hook element and the closing element remain at the ground position because the butts (3) and (4) are "o" positioned. That means missing and stretching the old stitches without another knocking-over.

g) "s" butt position; the way for receiving and knitting on the receiving needles (~ ~ ~ ~).

The butt (3) is put into movement by the fixed cam (8) (cam (7) in "|" position), is guided by the fixed cam (22) and is supplementary raised by the cam (16) ("+" position) (cams (10) and (14) in "|" position). Then the butt (3) is gone off by the stitch wing (20) ("+" position) and is guided forward by the fixed cams (23) and (24).

Because the position "-" of the cam (30), "|" of the cams (26) and (27), "+" of the cam (29) and because of the fixed cam (31) the closing element is raised up to the clearing position. Then the butt (4) is gone off to the ground position by the fixed cams (33) and (34).

3. Conclusions. The Knitran system presented in this paper has the same technological possibilities (three ways for knitting, three ways for transfer, receiving and knitting) as the Knitran system for automatic flat knitting machines using compound needles with rib loop transfer spring situated on the hook element [1].

This solution is original because it is related to the compound needle with loop transfer spring situated on the closing element [2].

Compared with the previous solution, in this case the transfer of the loops is done more securely, because of the greater distance between needles during transfer [3].

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DEZVOLTĂRI ÎN CONSTRUCȚIA ȘI UTILIZAREA ACELOR CU ZĂVOR LA MAȘINILE RECTILINII DE TRICOTAT AUTOMATE (III)

(Rezumat)

Soluția constructivă pentru lacătul integrat de tricotare-transfer prezentată în lucrare este originală deoarece se referă la o mașină rectilinie de tricotat automată echipată cu ace cu zăvor și lamelă de transfer extinsă lateral amplasată pe tija zăvor.

Acest lacăt permite:

- acționarea independentă a tijelor cu cârlig și a tijelor zăvor;
- obținerea a trei traiectorii pentru tricotare, trei traiectorii pentru transfer și o traiectorie pentru transfer primire și tricotare (cu alimentare cu fir).

APPRÉCIATION DU COMPORTEMENT À L'USAGE DES MATÉRIAUX TEXTILES

PAR

STAN MITU, CARMEN LOGHIN et MIHAELA MITU

1. Introduction. Cette étude est une conséquence de la nécessité de perfectionnement de la qualité des produits d'habillement, par l'acceptation correcte des paramètres du traitement humido-thermique en connection aussi avec le comportement des matériaux textiles aux traitements thermiques ainsi que pendant l'usage.

Dans notre travail sont inclus amples aspects théoriques, des méthodes et des moyens d'expérimentation et d'interprétation, valables non seulement pour les résultats y présents mais aussi par rapport à l'apparition de nouveaux types de matières premières avec des particularités adéquates. Les résultats de la recherche complètent des banques de données existantes dans ce domaine et ils peuvent être mis à côté des résultats d'autres recherches semblables dans ce domaine complexe qui est le finissage humido-thermique dans les confections.

Bien que le finissage dans le concept industriel de réalisation représente la partie de la technologie de fabrication qui appliquée aux produits confectionnés permet l'obtention des formes, des aspects et de la qualité adéquats, ou est obligé pourtant de mettre en évidence le rôle du fixage par lequel on obtient une stabilité dimensionnelle; dans le cas des matériaux en fibres cellulosiques, celle-ci peut être réalisé par l'élimination des tensions par la destruction des liaisons de hydrogène à la suite du gonflage et de l'apparition de nouvelles liaisons d'hydrogène dans la forme décontractée du produit textile.

Les premières recherches sur le fixage des fibres de laine ont été entreprises à partir de 1930, celui-ci étant expliqué comme un processus complexe de modification de la structure supramoléculaire par le transformation de la α -kératine en β -kératine, simultanément avec quelques modification chimiques comme la destruction de la liaison cistinique et l'apparition d'autres liaisons transversales entre les principales chaînes d'atomes qui forment la fibre, ainsi que la destruction des liaisons d'hydrogène et leur réfection dans autres positions.

Sans entrer en détails on signale que le fixage de la laine peut être réalisé de deux manières:

- sous l'action de certains agents physiques (par exemple une fibre de laine fortement allongée et en même temps traitée avec de l'eau bouilli ou de la vapeur d'eau);
- sous l'action de certains agents chimiques réducteurs ou oxydants.

Des processus d'étirage, de lissage et de fixage à l'état lisse se produisent non seulement dans les étapes de finissage chimique mais aussi lors de traitements humido-thermiques.

Le fixage des matériaux synthétiques est un processus complexe qui entraîne la présence de la chaleur, de l'humidité et de la tension. La plupart des fibres et des matériaux synthétiques réagissent facilement, c'est pourquoi le fixage représente une étape nécessaire dans le travail des fils et des tissus.

Le fixage modifie les propriétés et la structure supramoléculaire des fibres et en même temps il assure l'équilibre de la structure du produit textile qui doit rester stable aux traitements ultérieurs et pendant l'usage.

En général, le fixage modifie les propriétés physiques des fibres, des fils et des matériaux comme par exemple les caractéristiques physico-mécaniques à savoir les caractéristiques effort-allongement, résistance, allongement, module, retour du chiffonage, effect pilling et caractéristiques spécifiques aux traitements thermiques et humido-thermiques. Il s'impose la présentation d'une part de quelques aspects concernant les modalités d'appréciation du comportement à l'usage, et d'autre part la présentation de quelques caractéristiques fonctionnelles des matériaux textiles et des produits d'habillement.

Pour établir la valeur d'usage des produits d'habillement, des essais de comportement sont nécessaires, poursuivis systématiquement et en corrélation avec les propriétés physico-mécaniques, esthétiques et de confort obtenues sur les appareils de laboratoire.

Chaque essai de comportement doit renfermer un nombre assez grand d'objets de même type et il faut utiliser plusieurs sujets de même type dans le but d'obtenir des conclusions satisfaisantes.

Il faut faire une différence entre les articles de mode dont l'usage est déterminé par la valeur de présentation, les articles d'habillement et linges qui doivent il faut allier les propriétés de durabilité et de confort et les produits techniques qui en général ne doivent satisfaire que la condition de durabilité.

Les résultats d'essais pratiques de comportement sont d'une grande valeur, constituant une base numérique pour la comparaison et la corrélation avec les résultats obtenus sur les appareils, qui se trouvent en fait à la base de la conception et la construction de ceux-ci.

Même à partir de cette partie introductive, le travail introduit quelques éléments à même d'éclaircir la corrélation entre les résultats des tests de laboratoire et ceux des essais de comportement aussi bien par l'analyse d'une caractéristique que par un indice global qui présente en même temps quelques aspects concernant l'influence des propriétés des fibres, des fils, des tricotés et des tissus ainsi que des technologies de finissage et thermo-adhésion sous les caractéristiques fonctionnelles de produits d'habillement.

2. Moyens pratiques d'évaluation du comportement à l'usage dans des conditions de laboratoire. Au cours du processus d'usage, les vêtements sont soumis à un léger frottement continu auquel participent des détails des produits ou des objets: des housses pour les meubles, etc.

La durée d'apparition et d'existence d'une effilochure peut être divisée en trois étapes:

- l'apparition d'un duvet de fibres sur la surface du matériau textile;
- l'agglomération de fibres et la formation de l'effilochure;
- la rupture de l'effilochure.

La durée de ces trois étapes dépend de la tendance à l'effilochage des matériaux textiles, déterminée par les propriétés des fibres et de leur interaction.

Cela est représenté graphiquement (fig.

1) où l'on peut voir que par l'élimination des effilochures, le matériau revient à l'aspect initial sans tenir compte de la possibilité de modification des paramètres: l'épaisseur, la perméabilité à l'air, l'isolation thermique, la perméabilité la vapeur.

La durée de l'expérience est dépendante du tissu. La formation du duvet de la première étape n'a pas lieu par le détachement d'une extrémité des fibres du tissu, mais seulement autour des fibres dont les deux extrémités restent fixées.

L'explication est logique parce qu'une fibre fixée seulement à une extrémité se plie et elle ne forme pas d'effilochages, son orientation étant imposée par le matériau contre lequel elle se frotte. Dans le processus de frottement de deux matériaux, l'extrémité courte de la fibre fixée s'échappe et elle peut être observée au microscope. Cela a été confirmé pratiquement par la coloration d'un matériau avec un colorant sans résistance à la lumière, irradié avec des ultra-violets et soumis à la formation des effilochages.

On a constaté que les fibres effilochées étaient plus intensément colorées à une extrémité seulement, donc celles-ci provenaient de l'intérieur du tissu où la lumière n'avait pas pu décolorer les fibres.

La manière de formation des effilochages dépend des caractéristiques des fibres, comme il suit:

Etape	Les caractéristiques des fibres
I. la formation du duvet	- comportement au fléchissement répété - résistance à la rupture - comportement au frottement
II. la formation de l'effilochage	- résistance à la rupture et à l'allongement - élasticité - comportement au frottement
III. la rupture de l'effilochage	- comportement au fléchissement - résistance à la rupture

Les fibres avec une grande valeur des forces de frottement s'opposent à l'extraction du matériau, tandis que celles qui ont une valeur plus petite se rompent avant la migration à la surface. Cette caractéristique influence l'épaisseur et la longueur

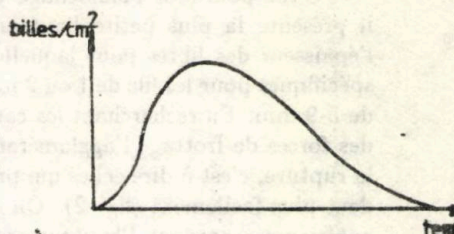


Fig. 1

du duvet. Après le frottement continue, on passe à la deuxième étape quand les fibres s'agglomèrent, seulement dans les conditions dans lesquelles on arrive à une certaine longueur et épaisseur sur l'unité de surface.

Pour la formation de l'effilochage, il est nécessaire une longueur critique du duvet qui peut atteindre la valeur de 0,8 mm. L'hauteur critique ou la longueur du duvet baisse dans l'ordre suivante: acétate, laine, PNA, PA, PES, coton.

C'est pourquoi l'effilochage apparaît le plus facilement au coton parce que il présente la plus petite hauteur critique. Ce comportement dépend aussi de l'épaisseur des fibres pour laquelle la littérature de spécialité indique des valeurs spécifiques pour les fils de 1 ou 2 mm. Pour l'hauteur critique est indiquée la valeur de 5-9 mm. En recherchant les caractéristiques des fibres, on a constaté qu'à côté des forces de frottage l'agglomération est en concordance avec le comportement à la rupture, c'est à dire celles qui présentent la courbe avec la plus grande pente se tordent plus facilement (fig. 2). On constate que l'ordre correspond à l'énumération antérieure regardant l'hauteur critique. Même si les fibres textiles ont la même finesse, les agglomérations apparaissent plus intensément au cas de fibres avec une plus grande rigidité, quoique celle-ci ne puisse pas être le facteur déterminant parce que l'hauteur critique grandit en fonction de la grosseur de la fibre. On suppose que la résistance des effilochures et leur formation dépend du degré du retour.

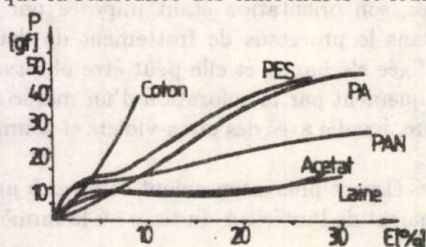


Fig. 2

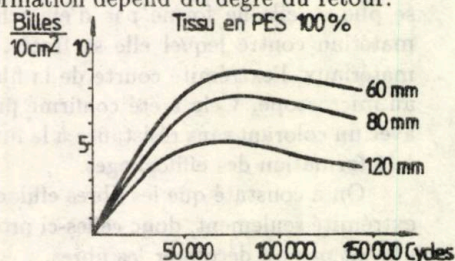


Fig. 3

La dernière étape se réfère à la rupture des effilochages qui correspond au moment où, les fibres desquelles sont fixées se détachent du matériau. Cela correspond à la situation auquel la force de traction pendant le frottage est plus grande que la résistance des fibres au détachement ou quand le nombre des fléchissements en différents sens correspond à la rupture. En général, les recherches ont démontré que les synthétiques présentent une résistance plus grande que celles naturelles.

On peut remarquer le fait que la troisième étape dépend du matériau, le facteur déterminant étant la rigidité de la fibre de fixage, qui peut être modifiée tant après des traitements humido-thermiques qu'après des traitements thermiques spécifiques à l'industrie de l'habillement.

Il s'impose donc la présentation de quelques aspects concernant l'influence des caractéristiques des matériaux sur la tendance d'effilochage. La fibre offre une première possibilité d'évaluation.

Plus elle est longue, plus la surface de contact avec les autres est plus grande, et aussi la surface du frottage. C'est pourquoi son relâchement et son extraction

sont plus difficiles. Le duvet formé est moins dense, donc peu de fibres peuvent s'agglomérer. Dans la troisième figure on peut suivre l'influence du nombre des cycles du frotage sur le nombre des effilochures qui apparaissent sur la surface de 10 cm^2 sur un tissu en polyester où la longueur des fibres qui composent les fils est différente. Les fibres plus courtes ne peuvent pas être ancrées parfaitement dans la structure, ayant tendance même à partir du processus de tissage vers les conches extérieures, en déterminant dans le produit fini une formation plus accentuée d'effilochures.

C'est recommandable donc que la longueur des fibres synthétiques corresponde à la moyenne de la longueur des fibres de laine dans le cas d'un mélange avec ce-la.

Un autre facteur déterminant pour la formation des effilochures est la finesse de la fibre (le titre). En même temps, avec l'augmentation de la grosseur, se développe la rigidité de la fibre et la résistance de celle-ci à l'action de faiblesse et d'extraction. À part cela, dans un duvet formé de fibres plus denses, celles-ci s'agglomèrent en nombre diminué. Les recherches ont démontré que l'augmentation de la finesse des fibres dans un mélange de nylon et de laine (10/90%) de 3 à 20 dtex baisse considérablement la formation des effilochures. On remarque même la disparition totale des effilochures dans la situation où la fibre de nylon a une finesse de 20 dtex.

En général on évite telles différences entre la finesse des fibres parce que pendant le tissage les fibres plus fines sont accrochées à l'intérieur tandis que les plus denses tendent vers la conche extérieure du matériau en augmentant l'aspérité des surfaces dans une manière désagréable. D'autre part, il n'est pas nécessaire l'augmentation accentuée du diamètre des fibres parce que la rigidité grandit avec le carré du diamètre. Par exemple, en passant de 3 à 4 dtex, la rigidité grandit de 1,7-1,8 fois et le nombre des fibres baisse 25%.

Dans la figure 4 est représentée la manière d'apparition d'effilochage à un tricot en polyester en fonction de la finesse des fibres. Le comportement à l'effilochage des fibres

froncées n'est pas complètement clarifié. Ainsi sont-elles mieux intégrées dans le matériau mais elles s'agglomèrent à la suite du frottement beaucoup plus facilement. Cette affirmation est confirmée aussi du fait que dans les conditions où dans le processus d'usinage disparaît la fronce originale, l'effilochage n'en est pas influencé.

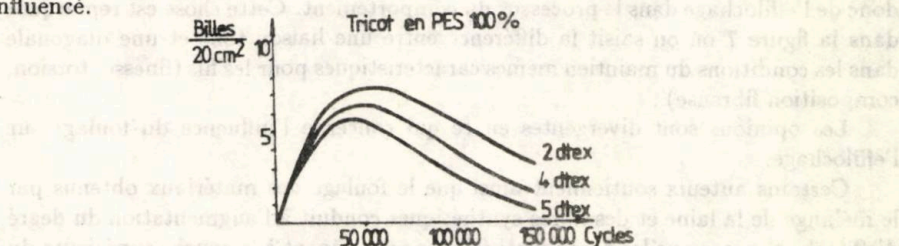


Fig. 4

Un autre facteur qui influence l'effilochage, en liaison avec les caractéristiques

de la fibre, est la section dépendente de la forme des filières de l'usinage physique. Il est difficile de préciser si une surface effilochée ou profilée des fibres conduit à un ancrage meilleur de celles-ci dans les tissus. La pratique démontre que les fibres profilées baissent la tendance d'effilochage des tissus. C'est aussi qu'aux tissus de 100% polyester, avec le profil des fibres une „étoile“ avec 3 ou 5 coins, la tendance d'effilochage est beaucoup plus petite que pour celles avec la section circulaire (fig.5).

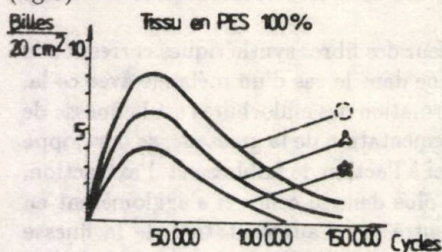


Fig. 5

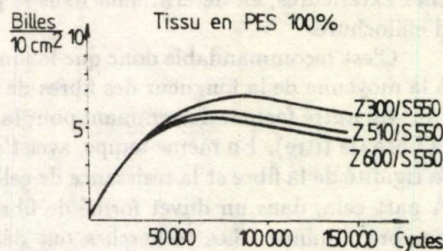


Fig. 6

L'élément suivant de la composition du matériau est le fil avec sa caractéristique principale, le degré de torsion. Avec le développement du degré de torsion, la pression entre les fibres augmente ce qui conduit à leur meilleure intégration donc à la diminution de la tendance d'effilochage (fig.6).

C'est à remarquer pourtant qu'aux tricots, le degré de torsion n'influence pas la tendance de former des effilochures; cela s'explique parce que l'influence réciproque, degré de torsion et degré d'effilochage a lieu seulement aux torsions moyennes, caractéristique pour les tissus mais non pour les tricots, où les fibres ne sont pas pressées l'une à l'autre suffisamment.

Le degré de formation du duvet baisse aussi quand on choisit une grande épaisseur du tissu. Cela on l'obtient par l'augmentation du nombre des éléments de liaison des fils sur l'unité de surface de sorte qu'à la même masse du tissu, la finesse des fils augmente et qu'à la même finesse le nombre des fils sur l'unité de longueur baisse aussi.

La structure des matériaux influence évidemment l'apparition de l'effet pilling donc de l'effilochage dans le processus du comportement. Cette chose est remarquée dans la figure 7 où on saisit la différence entre une liaison toile et une diagonale dans les conditions du maintien mêmes caractéristiques pour les fils (finesse, torsion, composition fibreuse).

Les opinions sont divergentes en ce qui concerne l'influence du foulage sur l'effilochage.

Certains auteurs soutiennent ainsi que le foulage des matériaux obtenus par le mélange de la laine et des fibres synthétiques conduit à l'augmentation du degré d'effilochage parce que les fibres synthétiques parviennent à la couche supérieure du tissu, leurs extrémités pouvant être extraites facilement. Les autres soutiennent que les fibres de laine parviennent à la surface du tissu où elles se freuvent et elles forment une couche protectrice des fibres synthétiques.

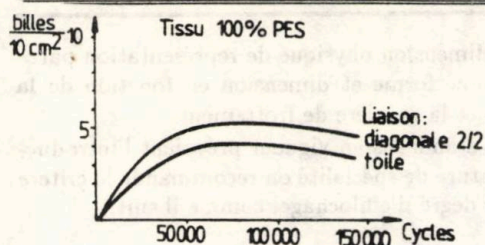


Fig. 7

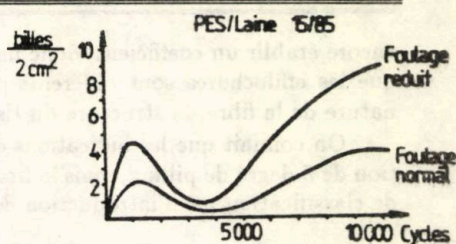


Fig. 8

Les recherches ont montré qu'aux tissus en laine avec tout au plus 20% fibres de polyamide ou du polyester, par le foulage, les fibres synthétiques parviennent dans la couche extérieure en plus des fibres de laine si la densité du matériau est réduite. Au cas où la densité du tissu est grande seulement des fibres de laine apparaissent à la surface.

Dans la figure 8 le degré d'effilochage des deux tissus foulés différemment est indiqué. Dans le processus du foulage, des effilochures des fibres de laine se forment premièrement et puis, par leur élimination se forment des effilochures de fibres synthétiques.

C'est très important de connaître l'influence des colorants, des détergents et des substances de finissage sur le processus d'effilochage. Les recherches ont montré que le processus de coloration n'avait pas influencé l'apparition de l'effilochage tant qu'on n'a pas utilisé des solutions ayant comme principal élément le savon. Au cas de l'utilisation de ces solutions, les matériaux colorés s'effilochent de plus ce qui démontre qu'elles agissent comme un moyen de glissement. Aux tricotés on a constaté le contraire; traités avec du savon dans des conditions spéciales de lavage et séchage ils s'effilochent moins parce que les particules du savon entrent dans les enforcements de la surface des fibres en leur augmentant la surface de contact en les faisant s'attacher les unes dans les autres. Les substances huileuses utilisées au finissage augmentent le degré d'effilochage, agissant comme un moyen de glissement, et les substances utilisées aux traitements d'inchiffaunage et basée de règle sur la résine collent les fibres et conduisent à une diminution du degré d'effilochage.

Ayant en vue le processus de finissage des produits d'habillement c'est important d'analyser l'influence de la chaleur sur l'effilochage. Le degré d'effilochage baisse dans des conditions de pression avec des valeurs en corrélation avec le temps et l'humidité, par le nivellement des tensions entre les fibres thermoplastiques.

Le flambage de la surface des matériaux conduit à la formation des petites braines qui réduisent aussi la tendance d'effilochage.

En même temps le brossage, le brûlement et le coupage des fibres de surface constituent des facteurs importants dans la diminution du degré d'effilochage. La fixation des extrémités des fibres est plus accentuée au cas du processus de thermocollage.

Pour l'appréciation de l'effilochage donc aussi de l'effet pilling on n'a pas pu

encore établir un coefficient, donc une dimension physique de représentation parce que les effilochures sont différents comme forme et dimension en fonction de la nature de la fibre, la structure du tissu et la manière de frottement.

On connaît que les indications des standards en vigueur prévoient l'introduction de 5 degré de pilling, mais la littérature de spécialité on recommande le critère de classification par l'introduction de 8 degré d'effilochage, comme il suit:

Le degré d'effilochage	Des caractéristiques
1	- effiloché, fibreux, duveteux
2	- pincé en partie, encore duveteux
3	- effilochures isolées en phase de mise en évidence
4	- le nombre des effilochures en formation augmente
5	- un peu effiloché, des effilochures indélimitées
6	- effiloché, des effilochures délimitées
7	- puissamment effiloché
8	- effilochage maximum, des effilochures bien délimitées, surface granulée.

L'appréciation du degré du pilling peut être réalisée aussi à l'aide des étalons photographiques. Pour appréciation on emploie aussi des étalons photographiques gradués conventionnellement. Ces étalons on les sur groupes d'articles en tenant compte de la nature de la matière première, de la structure, du coloris, etc. La manière d'évaluation du comportement à l'usage à été présentée antérieurement où on avait mis en évidence en particulier l'effet pilling avec les 5 ou 8 degrés.

Pour éviter l'effet pilling il est nécessaire qu'on prenne des mesures spéciales, en augmentant les torsions avec 10-15%, aux tissus qui ont plus de 40% fibres synthétiques.

C'est possible une migration plus abondante des fibres en cas des articles tricotés qui ont une structure plus légère que celle des tissus; les billes résultées sont plus grandes que celles formées sur le tissu, l'aspect d'agréable étant plus prononcé à l'usage.

Certains articles tricotés en fibres PAN ont la particularité de présenter après l'usage un effet pilling spécifique, avec des billes plus raréfiées qui se décomposent après le lavage, en donnant au produit un aspect d'effilochage accentué.

Parce qu'au l'usage pratique le teste d'analyse de l'effet pilling prend beaucoup de temps, on fait souvent appel au teste de laboratoire. Les expériences de laboratoire doivent accomplir une condition essentielle, plus précisément, les effilochures formées doivent correspondre à la réalité comme dimension et concentration. Le test de laboratoire a lieu beaucoup plus vite et il sollicite le matériau plus intensement. La sollicitation peut être réalisée pour le frottement léger sous pression et en différents sens. Dans ce cas il faut respecter les conditions suivantes:

1. La surface du tissu doit être la plus grande possible, ayant la limite inférieure de 50 cm².

2. Le test doit se dérouler sans tensions ou sous une tension minimale, parce qu'une tension augmentée lie les fibres puissamment et on pourrait conclure que le tissu ne s'effiloche pas.

3. La pression qui correspond à l'objet pour frottement appliquée sur le matériau doit avoir les valeurs entre 0-50 gf/cm².

4. Le matériau sur lequel le tissu à tester se frotte doit être le plus résistant possible, avec une surface uniforme.

5. En ce qui concerne le mouvement relatif entre l'essai et le matériau sur lequel celui-ci se frotte, on recommande une courbe close, d'habitude elliptique pour l'allègement de l'agglomération de la fibre.

6. La vitesse du mouvement rotatif doit être la plus grande possible pour permettre la réalisation rapide du test. On peut enregistrer aussi la courbe de variation du nombre des effilochures pendant ou en fonction du nombre des cycles.

7. Le matériau à tester doit être maintenu au moins 24 heures en atmosphère STANDARD et c'est recommandable de réaliser le test après la teinture ou le traitement chimique des matériaux parce que certains finissages peuvent influencer la formation des effilochures.

D'après la manière dans laquelle on respecte les conditions y mentionnées, il y a plusieurs précédés qui peuvent être divisés en deux groupes:

1. Des procédés par lesquels l'essai est tendu sur un cadre avec un mouvement prescrit en fonction de la nature du frottement.

2. Des procédés par lesquels l'essai est porté libre dans un récipient en réalisant plusieurs déterminations en même temps, en réalisant le frottement matériau sur matériau et à leur tour sur des corps mous (du caoutchouc microporeux qui double le récipient).

Requ le 17 December 1992

*Institut Polytechnique, Jassy,
Chaire de Tricotages
et Confections*

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APRECIEREA COMPORTĂRII LA PURTARE A MATERIALELOR TEXTILE

(Rezumat)

În lucrare sunt prezentate ample aspecte teoretice, metode și mijloace de experimentare și interpretare a anumitor fenomene ce apar în timpul purtării materialelor textile, valabile și în raport cu apariția noilor tipuri de materii prime cu particularități corespunzătoare.

**RESEARCHES REGARDING THE USE OF COMPUTER
PROGRAMMING AND TECHNOLOGICAL PARAMETERS
CALCULUS FOR SINGLE JERSEY CIRCULAR
KNITTING MACHINES WITH NO PATTERN DEVICE**

BY

COSTEA BUDULAN and LAURA MACOVEI

1. Introduction. The preparation for obtaining quality knitted frames requires the knowledge not only of the technological programming, but also of the technological parameters.

In the classic manner, to program a knitting machine or to calculate technological parameters would require a lot of qualified work and time. This is the reason of using computer programming. It ensures:

- the working time shortage,
- the programming and calculus precision,
- no need for qualified staff trained in technology and machinery.

The paper presents the programming methodology and technological parameters calculus for large diameter circular knitting machines, using the computer.

The program has in its menu two different options: one for the technological programming and the other for the technological parameters calculus. It is written in BASIC and it is TIM-S, ZX-Spectrum and HC-85 compatible. It is also possible to transpose this program in other BASIC languages (e.g., GWBasic), that are IBM-PC compatible.

For example a single jersey circular knitting machine, with no pattern device has been chosen. It can produce knitted structures based on plain knit, especially plated plain knit with in-lay threads.

The machine is equipped with: spring bearded needles, three types of needle guider jack (with two level butts: i-s, s-i and s-s), sinkers for closing, knock over and looping, individual pressers and yarn carriers. The cylinder cams have a two level disposal, in correspondence with the levels where the jack butts are placed. Each knitting cam track (system) can be divided into 3 distinct zones. In these zones the yarns are fed: the ground thread, the binding thread and in-lay thread.

Figure 1 presents, in a simplified manner, the stitch forming device (the knitting elements and the cams), as follows:

- A, B, C – needle guider jacks,
C – in-lay thread,
F – ground thread,
V – binding thread.

This machine has the following technological possibilities:

1. plain knit
2. plain knit with color strips
3. plated plain knit
4. plated plain knit with color strips
5. plain knit with tuck stitches
6. plain knit with in-lay thread
7. plated plain knit with in-lay thread
8. plain knit with in-lay zones
9. plain knit with color strips and tuck stitches
10. plain knit with tuck stitches and in-lay thread.

The program, presented in Fig. 2, allows a quick response in design elaboration for all the above mentioned possibilities, and offers in extend:

- the machine technological features,
- the stitch forming device, that includes: the cylinder cams, the relative position of the knitting elements, the pressers and their cams,
- the machine technological possibilities,
- the symbols used for stitch representation,
- the choosing of the pattern dimensions,
- the pattern representation,
- the machine technological programming.

The last point includes:

- the jacks adjustment,
- the adjustment of the pressurs and their cams (whenever necessary),
- the programming table, presented as follows:

R	Z zone	yarn code	c_i/s	k_i/s
	uneven cam track		v_i/s	
	even cam track			

Each rubric of the table heading represents:

R = number of each course in the pattern,

yarn code = a number symbolizing the yarn size, its fibrous composition and its color each thread fed to each zone or system,

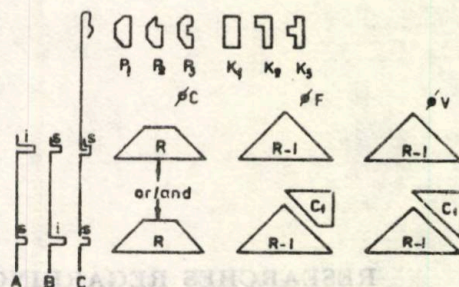


Fig. 1

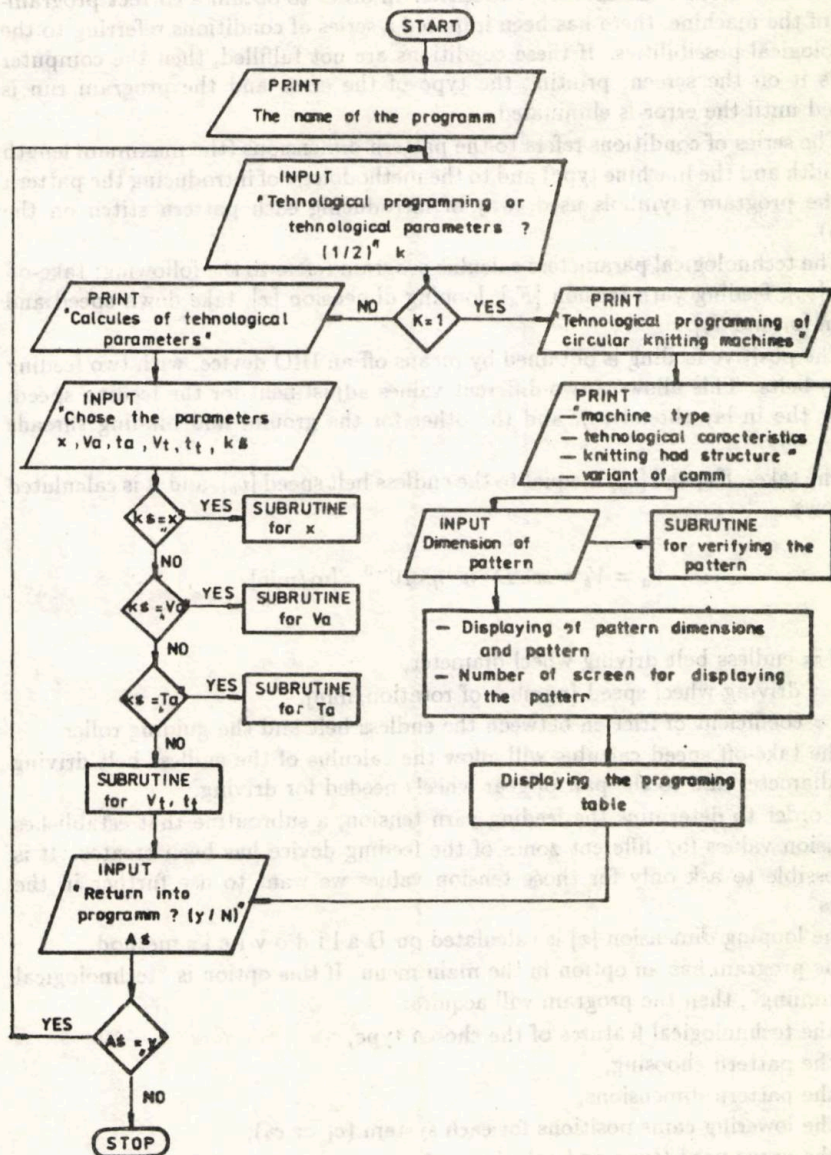


Fig. 2

$c_{i/s} = c_1$ or c_2 cam for each system,

$v_{i/s}$ = adjustment variants for the raising cam R for each system,

$k_{i/s}$ = type of acting pressers cam for each system.

2. Technological Parameters Calculus. In order to obtain a correct programming of the machine, there has been imposed a series of conditions referring to the technological possibilities. If these conditions are not fulfilled, then the computer signals it on the screen, printing the type of the error and the program run is stopped until the error is eliminated.

The series of conditions refers to the pattern dimensions (the maximum length and width and the machine type) and to the methodology of introducing the pattern into the program (symbols used, way of introducing each pattern stitch on the screen).

The technological parameters calculus program refers to the following: take-off speed $[v_a]$, feeding yarn tension $[F_a]$, looping dimension $[x]$, take down speed and tension $[v_t]$ and $T_t]$.

The positive feeding is obtained by means off an IRO device, with two feeding endless belts. This allows a two different values adjustment for the feeding speed: one for the in-lay thread (c), and the other for the ground and binding threads ($F + v$).

The take-off speed $[v_a]$ is equal to the endless belt speed $[v_b]$, and it is calculated as follows:

$$V_a = V_b = \pi \cdot D \cdot n \cdot \eta \cdot 10^{-3} \quad [\text{m/min}],$$

where:

D = endless belt driving wheel diameter,

n = driving wheel speed [number of rotation/min],

η = coefficient of friction between the endless belt and the guiding roller.

The take-off speed calculus will allow the calculus of the endless belt driving wheel diameter and to the pair of gear wheels needed for driving.

In order to determine the feeding yarn tension, a subroutine that establishes the tension values for different zones of the feeding device has been creates. It is also possible to ask only for those tension values we want to use further in the calculus.

The looping dimension $[x]$ is calculated on D a l i d o v i c i's method.

The program has an option in the main menu. If this option is "technological programming", then the program will acquire:

- * the technological features of the chosen type,
- * the pattern choosing,
- * the pattern dimensions,
- * the lowering cams positions for each system (c_1 or c_2),
- * the yarns used (type and color),
- * the programming table.

The second option regards the technological parameters. It needs the following inputs:

- * length of the yarn used to form a stitch,
- * number of needles and machine speed [rot/min],
- * yarns size,
- * knitting elements dimensions,
- * the values of the coefficient of friction between the yarn and the guiding organs and between the threads themselves.

3. Conclusions. The program gives the opportunity of obtaining quickly all the data referring to the technological programming or parameters calculus.

The program is easy to handle, no error is possible.

The results can be listed and used immediately in the knitting sector.

Using the computer means an important shortage of time necessary in technological programming and technological parameters calculus.

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CERCETĂRI PRIVIND UTILIZAREA CALCULATORULUI ÎN PROGRAMAREA ȘI CALCULUL PARAMETRILOR TEHNOLOGICI PENTRU MAȘINI CIRCULARE DE TRICOTAT CU UN CILINDRU FĂRĂ MECANISM DESENATOR

(Rezumat)

Lucrarea prezintă metodologia de programare precum și calculul parametrilor tehnologici pentru mașini circulare de tricotat cu diametru mare fără mecanism desenator, utilizând tehnica de calcul. Programul poate fi utilizat fie pentru calculul parametrilor tehnologici ai operației de tricotare, fie pentru programarea tehnologică a mașinii de tricotat. Programul a fost elaborat în limbaj BASIC compatibil calculatoarelor tip TIM-S, ZX-SPECTRUM, HC-85.

APPROACHES ON DYNAMIC ANTHROPOMETRY WITH A VIEW TO IMPROVING WORKING CLOTHING

BY

AURELIA BRUMARIU, EMILIA FILIPESCU and MIOARA CREȚU

1. Introduction. The anthropometric standards (A.S) and the branch technical standards (BTS) which dimensionally control the standard size and the ready made clothes are worked out on the anthropometric data taken from the individuals in a static position. These data do not satisfy the requirements of the pattern technician who has to dimension the garments for a body in motion.

During motion the position of the body is modified and consequently the distances between different anthropometric points get modified as well. Thus, an approach is necessary on the modification undergone by different body measurements for some positions of the trunk, head and limbs frequently met during the individuals activities.

The difference between the value of a measurement taken for a certain dynamic position and the value of the same measurement in a static, is called "dynamic effect" and can be expressed both in absolute values (absolute dynamic effect, cm) and in percentage (relativ dynamic effect, %) [1].

It is very important to know the dynamic effects, but their usage in pattern construction must be differentiated taking into account the field in which clothing is used (everyday clothing, working and protective clothing, sportswear), according to the type and their use the dynamic effects being partially or totally considered [2].

The paper deals with the evaluation of the sizes of the dynamic effects measured during different typical motions for a set of body measurements necessary to dimension the working clothing (such as overalls) made of blouse and trousers [3].

2. Research Method. The garment we are dealing with is used as working and protective equipment by a large number of workers in the mechanic field: locksmiths, turners, milling-machine operators, welders etc.

The observations on the working process in these fields of activity revealed a set of motions frequently performed. These motions stress especially the area of the armhole-sleeve (with the blouse) and that of the waist-crutch depth (with the trousers).

Due to the fact that this clothing is widely used in very many ranges of activity

and that the dynamic positions are of a large variety, eight dynamic positions have been chosen which are frequently met in more working places. They have an important influence on the distances between the anthropometric points leading to important dynamic effects for some body measurements.

After a preliminary survey which enabled the setting up of the representative number of individuals, the anthropometric inquiry has been done on a sample (n) of 400 individuals differentiated into age groups according to the diagram in Fig. 1.

Age group (years old)		Number of individuals
20-33		224
34-45		121
46-62		55

Total: 400

Fig. 1.- Allocation of individuals selected on age group

The anthropometric survey has developed the following steps:

- 1) Eighteen anthropometric points both for static and dynamic measurements have been marked on the individual to be measured;
- 2) Twenty body measurements in static position have been taken from each individual. The measuring method and appliances correspond to the standard method [4]. In Table 1 fourteen of these measurements are listed as they were taken as well as the code used during the inquiry;

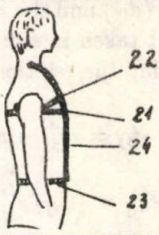
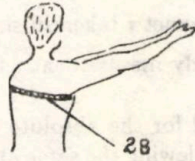
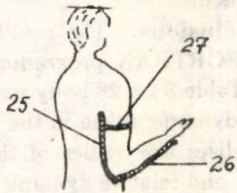
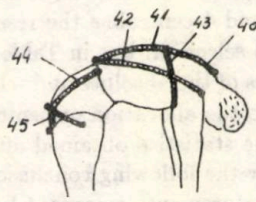
Table 1

List of body measurements taken in static position

Code	Body measurement	Symbole
01	Height	I_c
02	Chest	P_{bII}
03	Bust	P_{bIII}
04	Waist	P_t
07	Top arm	P_{br}
08	Back arm length	L_{pbr}
09	Back length from armhole to wrist	L_{pms}
10	Front length from neck to waist	L'_{Tf}
11	Back armhole depth	ARS
12	Nape to waist	L_T
14	Shoulder height oblique to waist	I_{ou}
15	Back length of the lower part of trunk	L_{pitr}
16	Back width	l_s
17	Back transversal arch of crutch region	A_{trf}

3) Each individual performed the eight dynamic position as follows: I, IV, II, III, VIII, VI, VII, V. In each dynamic position a limited number of body measurements has been taken. Table 2 selectively shows four of the studied dynamic positions (I, IV, II, V) and the measurements in each of these positions.

Table 2
The dynamic selected positions

Code	Body measurements	Body motion	
21	Chest		Position I
22	Bust		Deep breathing
23	Waist		
24	Front length from neck to waist		
28	Back width		Position II Arms horizontally extended forward with closed palms
25	Back arm length		Position IV
26	Back length from armhole to wrist		Arms vertically positioned forearm bent 90° in elbow joint
27	Top arm		
40	Back armhole depth		Position V
41	Nape to waist		Trunk bent forward, leg extended, arms on hip
42	Shoulder high oblique to waist		
43	Back width		
44	Back length of the lower part of trunk		
45	Back transversal arch of crutch region		

The data of the survey have been statistically analysed following the algorithm:

For each body measurement taken in static and dynamic positions the main characterization statistic parameters have been calculated:

- selection mean $\bar{x}$ (cm),

- selection variance S_x^2 (cm²),
- standard deviation S_x (cm),
- variation coefficient V_x (%),
- limit error of selection mean $\Delta\bar{x}$ (cm),
- significance test applied $t_{\bar{x}}$

to the selection mean. The significance is tested according to tabulated of "Student's" t-test [5].

The absolute dynamic (d_{ij}) and the relative effects ($e_{d,ij}$) have been calculated for each body measurement taken in static and in one or more dynamic positions and for each individual, using the relations:

$$d_{ij} = x_{ij}^{(d)} - x_{ij}^{(s)} \quad (\text{cm}),$$

$$e_{d,ij} = \left(d_{ij} / x_{ij}^{(s)} \right) \cdot 100 \quad (\%),$$

where:

$x_{ij}^{(s)}$ = body measurement i taken in static on individual j ;

$x_{ij}^{(d)}$ = the same body measurement i taken in a certain position of the body, on individual j .

The values obtained for the absolute and relative dynamic effects have been statistically processed following the same algorithm for the onedimensional analysis of the 45 body measurements.

3. Results and Conclusions. The results of the statistical onedimensional processing based on a FORTRAN programme on a Felix C-256 computer, are selectively presented in Table 3 for 28 body measurements (14 body measurements in static and 14 ones in dynamic taken in the four positions shown in Table 2).

The Table 4 centralizes the values of the main statistic parameters which characterize the absolute and relative dynamic effects for the entire selection of the 400 individuals measured in the four selected dynamic positions.

The data processing has been done both on the total selection and on the age groups. The Tables 3 and 4 centralize the results of the calculus of the statistic parameters for the total selection, but in Table 5 we comparatively exemplify the arithmetical mean values of the absolute and relative dynamic effects registered on age groups (according to the allocation presented in fig. 1).

Having analysed the statistics obtained after processing the primary data of the survey, we may draw the following conclusions:

1. For all body measurements measured both in static and in dynamic positions, the selection means ($\bar{x}$) are statistically representative. The answer for the test t being affirmative, in all the cases $t_{\bar{x}}$ is greater than the tabulated value of t (for 399 number of degrees of freedom and a 5% significance level). The selection mean correctly approximates the mean for the hole population, the value of the selection limit error ($\Delta\bar{x}$) being generally under 0.5 cm (the measuring accuracy of the body measurements).

Table 3

The main characterization statistics for the body measurements taken in static and dynamic

Code	Body measurement	Body position	Statistics for hole inquiry						
			$\bar{x}$ (cm)	S_x^2 (cm ²)	S_x (cm)	V_x (%)	$S_{\bar{x}}$ (cm)	$\Delta\bar{x}$ (cm)	$t_{\bar{x}}$
01	Height	Static	171.21	40.00	6.32	3.69	0.316	0.619	27.09
02	Chest	Static	99.68	77.43	8.80	8.83	0.44	0.862	11.33
21	Idem	I	102.03	56.30	7.50	7.35	0.375	0.735	13.60
03	Bust	Static	94.17	56.34	7.51	7.97	0.375	0.735	12.54
22	Idem	I	97.44	53.66	7.32	7.51	0.366	0.717	13.31
04	Waist	Static	84.69	113.85	10.67	11.89	0.534	1.046	7.94
23	Idem	I	84.79	100.38	10.02	11.81	0.501	0.981	8.46
10	Front length from neck to waist	Static	43.54	8.33	2.89	6.63	0.144	0.282	15.07
24	Idem	I	45.85	14.04	3.75	8.17	0.187	0.366	12.23
08	Back arm length	Static	23.56	3.43	1.85	7.86	0.092	0.180	12.74
25	Idem	IV	26.44	4.58	2.14	8.09	0.107	0.209	12.36
09	Back length from armhole to waist	Static	48.49	6.82	2.61	5.39	0.131	0.256	18.58
26	Idem	IV	52.84	14.56	3.81	7.22	0.191	0.374	13.87
07	Top arm	Static	29.95	10.11	3.18	10.62	0.159	0.312	9.42
27	Idem	IV	31.42	12.41	3.52	11.21	0.176	0.345	8.93
11	Back armhole depth	Static	17.77	4.62	2.15	12.09	0.107	0.209	8.23
40	Idem	V	19.03	3.13	2.26	11.90	0.113	0.221	8.42
12	Nape to waist	Static	42.45	5.95	2.44	5.74	0.122	0.239	17.39
41	Idem	V	46.73	11.90	3.45	7.38	0.173	0.339	13.54
14	Shoulder height oblique to waist	Static	46.69	8.79	2.97	6.35	0.148	0.290	15.72
42	Idem	V	54.09	12.24	3.49	6.40	0.175	0.343	15.50
15	Back length of the lower part of trunk	Static	33.18	10.55	3.25	9.79	0.163	0.319	10.21
44	Idem	V	47.29	22.92	4.79	10.12	0.239	0.468	9.87
16	Back width	Static	39.95	10.24	3.20	8.01	0.16	0.314	12.48
28	Idem	II	52.12	16.01	4.00	7.68	0.20	0.392	13.03
43	Idem	V	54.32	18.07	4.25	7.82	0.212	0.416	12.78
17	Back transversal arch of crutch region	Static	49.49	20.63	4.54	9.18	0.227	0.445	10.90
45	Idem	V	53.63	22.79	4.77	8.90	0.238	0.466	11.24

2. The majority of dimensions measured both in static and dynamic varies a little, the selection being homogeneous. Thus V_x is generally smaller than 10%.

Table 4
The dynamic effects recorded in the selected dynamic positions

Nb.	Dynamic effect of body measurement x_i /position	Code $x_i^{(d)}$; $x_i^{(s)}$	Statistic parameters							
			$\bar{x}$		S_x		V_x		$\Delta \bar{x}$	
			cm	%	cm	%	%	%	cm	%
1	P_{bII} /pos. I	21; 02	2.36	2.35	1.55	1.62	65.68	68.78	0.152	1.159
2	P_{bIII} /pos. I	22; 03	3.27	3.48	1.84	2.12	56.08	60.79	0.181	0.208
3	P_t /pos. I	23; 04	1.66	1.92	1.38	1.61	83.57	84.20	0.136	0.158
4	L'_{Tf} /pos. I	24; 10	2.31	5.31	1.22	2.92	52.82	54.92	0.119	0.287
5	$L_{p br}$ /pos. IV	25; 08	2.88	12.41	1.27	5.87	44.18	47.29	0.125	0.577
6	$L_{p ms}$ /pos. IV	26; 09	4.35	8.97	2.49	5.29	57.23	58.93	0.244	0.519
7	P_{br} /pos. IV	27; 07	1.48	4.95	0.91	3.08	61.69	62.20	0.089	0.302
8	ARS /pos. V	40; 11	1.28	7.26	0.85	5.03	66.89	69.28	0.084	0.495
9	L_T /pos. V	41; 12	4.31	10.12	1.81	4.28	42.06	42.28	0.018	0.421
10	I_{ou} /pos. V	42; 14	8.02	17.25	2.56	5.84	31.98	33.88	0.252	0.574
11	$L_{pi tr}$ /pos. V	44; 15	14.11	42.73	3.71	11.63	26.28	27.23	0.364	1.143
12	A_{trf} /pos. V	45; 17	4.21	8.67	2.88	6.54	68.45	75.53	0.285	0.643
13	l_s /pos. V	43; 16	14.38	36.39	3.61	10.32	25.13	26.36	0.355	1.014
14	l_s /pos. II	28; 16	12.16	30.46	3.06	8.60	25.11	27.97	0.300	0.845

Table 5
The dynamic effects on age groups

Nb.	Body measurement/ Body position	The dynamic effects %			
		(20÷33)	(34÷45)	(46÷62)	Hole selection
		years old	years old	years old	
1.	Bust/pos. I	3.72	3.29	2.64	3.48
2.	Front length from neck to waist/pos. I	5.59	5.41	4.41	5.31
3.	Nape to waist/pos. V	11.27	9.19	7.10	10.12
4.	Back width/pos. V	39.91	34.5	28.06	36.39

Values of this statistics which are over 10% indicate a mean variability and it is recordered for dimensions such as "waist" (11.89% in static and 11.81% in dynamic) and "back armhole depth", respectively (12.09% in static and 11.9% in dynamic) dimensions influenced by the shape and posture of the human body. These values reveal the fact that in the studied selection, individuals with different body shapes and postures have been included.

3. The analysed motions lead to increase of the body measurements, the dynamic effects varying within wide ranges. Thus we record the smallest relative dynamic effect for "waist" (item I - 1.92%) and the highest for "nape to waist" (item V - 42.73%).

4. The results in the paper for certain dynamic effects are comparable to those recorded in the literature for the same body measurement and body position,

respectively. To exemplify, in Table 6 we list the data obtained in the paper and in the literature [2].

Table 6
Dynamic effects - comparative data

Nb.	Body measurement/ dynamic position	Relative dynamic effect (%)	
		Data of [2]	Present paper
1.	Waist/position I	1.50	1.92
2.	Top arm/position IV	4.00	4.95
3.	Back width/position II	36.90	36.39
4.	Back length of the lower part of trunk/position V	45.60	42.73
5.	Shoulder height oblique to waist/position V	16.30	17.25

5. The dynamic effect depends on the measuring position. For example for body measurement (16) "back width" - an increase of 30.74% in position II is recorded while in position V the dynamic effect is of 36.39%.

6. As it has been expected the value of the dynamic effects recorded for a certain body measurement in a determined position of the body depends on the individuals age. The examples in Table 5 show the fact that with the young age group 20-33 years old the dynamic effects are greater than at individuals between 46-62 years old. This is due to the greater mobility in joints and muscular force of the young people as compared to those of the old ones.

7. On dimensioning the patterns of the blouse and trousers, the values of the dynamic effects will be taken into account when establishing the ease allowance. Thus for the blouse when establishing the position of the bust line, waist line as well as the highest point on the front pattern, the dynamic effects registered for the following body measurements will be entirely taken into account: *ARS* (position V), *L_T* (position V), *L_{Tf}* (position I). When allocating the hole allowance on the segments on bust line, the modification of the back width in position II will be taken into account.

In drafting the trousers patterns the modification of the waist during deep breathing (position I) must be taken into consideration and when dimensioning the segments waist-crutch depth line, back width on hip line, the modification of the body measurements during the typical motions which influence them (e.g. position V) will be taken into account.

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STUDII DE ANTROPOMETRIE DINAMICĂ ÎN VEDEREA
PERFECTIONĂRII ECHIPAMENTELOR DE LUCRU

(Rezumat)

Lucrarea are ca obiectiv stabilirea mărimii efectelor dinamice înregistrate la diferite cote antropometrice pentru unele poziții ale corpului întâlnite frecvent în procesele de muncă, în vederea fundamentării științifice a adaosurilor de lejeritate necesare în dimensionarea echipamentelor de lucru.

CAD SYSTEM APPLICATIONS IN CUTTING SKIRT PATTERN

BY

ECATERINA PINTILIE, GEORGE CIUBOTARU,
EMILIA FILIPESCU and MIOARA CREȚU

1. Introduction. In our country, in garment factories, the process of pattern cutting does not provide a high manufacturing flexibility and the work range from a new pattern designing to its carrying out takes a lot of time.

The increase of the whole volume of designing work in the case of a very often pattern changing, implies the shortening of the technical reports elaboration cycle and the increase of the quality of the designing process.

Many foreign firms present systems for both creation patterning and elaboration of the technical reports in the garment industry field: CYBRID (U.K.), INVESTRONICA (Spain), LECTRA SYSTEMES (France), ASSYST (Germany), COMPUTER DESIGN (U.S.A) s.o. at very high prices which the small factories can not afford to pay in our country.

2. Experimental part. The present paper proposes an automate program of carrying out technical reports with a minimum necessary endowment or with just small investments, the most small garment factories have at their hand:

1. a compatible IBM PC 286 with 2Mb RAM and 40Mb HD;
2. mouse;
3. EGA or VGA display;
4. a plotter to obtain patterns and their framing at the scale 1:1.

In the garment field for the CAD system, the informational structural model must rely on the requirement of the standard pattern building methods for garments and on the elaboration principle of a model rational range.

A fashion collection can be set up starting from the concept of "family", i.e., a set of models are obtained starting from a basic unified construction, using the same constructiv - aesthetic diversifying criteria.

In the variant chosen for exemplification, the constructive solution is represented by the one pleat skirt basic pattern on the main elements, frontside and backside. The diversifying criterion is given by inserting a dividing line of the front side element, which is the same for all models. This section enables the insertion of several decorating elements of small dimensions (pockets, flaps, etc.) different

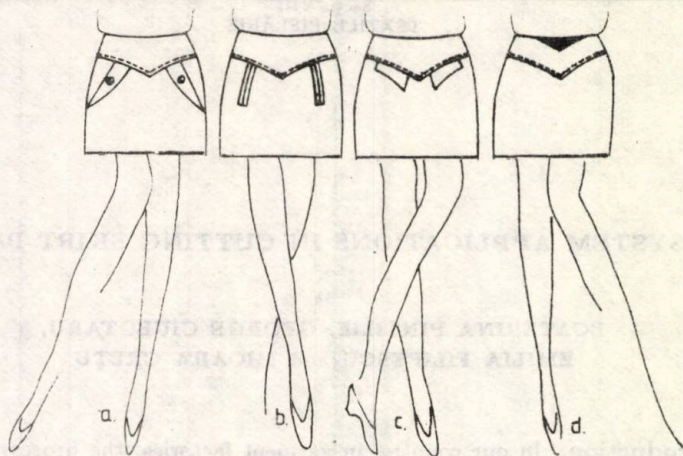


Fig. 1.- Models' Family.

by shape, color, material. Additionally, the designs have the some constructive – aesthetic solutions for the backside, the waist line and the same length.

The initial data used in organising the structural model are conventionally constant (dimensional standards of the standard body, dimensions propre to the item, basic shims, algorithms for building the basic patterns and variable as well (constructive peculiarities common for the model family due to fashion trends, tehnological shims, customers requirements, etc.).

The basic pattern designing system includes the following procedures:

- the selection of the information for the basic pattern designing, the standard body according to the standard respectively (size, waist, conformation) basic shims and the specific dimensions of the item (item length, sleeve length, cuff width, pleat length, etc.);
- algorithm for the point coordinate of the basic pattern, of the model pattern and of the gauge;
- the precise defining of the outline of the item guide marks (types of curves, tangent and countinuity restrictions) valid for the whole dimensional range;
- drawing of the basic pattern, of the model pattern and of the gauge, using the same pack of instructions (routines).

The algorithm for building a basic pattern assumes the presentation of the coordinates of the characteristic points of the guide marks related to the human body dimensions: body height (I_c), bust perimeter (P_b), waist perimeter (P_t) and hips perimeter (P_s), the shim of the waist line (Alt) and of the hip line (Als) as well as related to the dimensions specific for the designed item: item length (Lpr), the front side pleat length ($lgpf$) and the backside pleat length ($lgps$), etc.

For a number of models from the family of the women skirt, the algorithm for the basic frontside – backside pattern is established based on a construction made by hand practically checked.

The points coordinates, mathematically expressed versus a straight vertical orthogonal system, e.g. for the frontside of the skirt (fig. 2) are given by the relations:

$$x_1 = 0$$

$$y_1 = 0$$

$$x_2 = 0$$

$$y_2 = Lpr - 20$$

$$x_3 = 0$$

$$y_3 = Lpr$$

$$x_4 = x_5 - Ap/12$$

$$y_4 = Lpr + 0.5$$

$$x_5 = (2/3) \cdot (x_7 - x_3)$$

$$y_5 = Lpr - l_{gpf}$$

$$x_6 = x_5 + Ap/12$$

$$y_6 = y_4$$

$$x_7 = 0.5 \cdot ((Ps + 2)/2) - Ap/4 + 1.5$$

$$y_7 = Lpr + 1.5$$

$$x_8 = 0.5 \cdot ((Ps + 2)/2) + 1.5$$

$$y_8 = Lpr - 20$$

$$x_9 = x_8$$

$$y_9 = 0$$

where Ap is given by relation:

$$Ap = (0.5 \cdot ((Ps + 2)/2) - (0.5 \cdot (Pt + 2)/2))$$

The setting up of the curve types used in drawing the pattern outline of the pleat angle variable for any set of selected size, is also necessary. Between points (x_3, y_3) and (x_4, y_4) , an arc tangent to the first point of the horizontal line is selected with its center in the point (x_{11}, y_{11}) given by:

$$x_{11} = x_3$$

$$y_{11} = (y_3 + y_4)/2 + (x_{11} - (x_3 + x_4)/2) \cdot \operatorname{tg} \beta_1$$

$$\beta_1 = 90 + \arctg((y_4 - y_3)/(x_4 - x_3))$$

For the curve ranging between (x_7, y_7) and (x_8, y_8) an arc with the center in point (x_{15}, y_{15}) given by the below relations, is choisen:

$$x_{15} = (x_7 + x_8)/2 + (y_7 + y_8)/2 / \operatorname{tg} \beta_2$$

$$y_{15} = y_8$$

$$\beta_2 = \arctg((y_7 - y_8)/(x_7 - x_8)) + 90$$

In the same way the coordinates of the characteristic points of the basic back-side pattern have been determined.

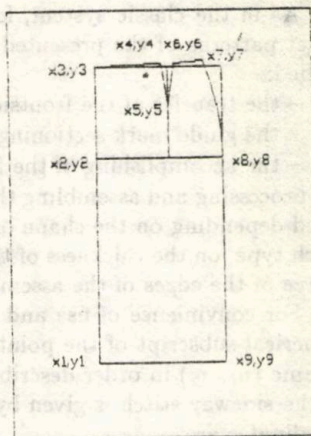


Fig. 2.- Basic block.

In the case of designing of a number of models which processing method is almost alike, it is recommended that the modification of the basic patterns should be carried on by remaking the calculations of the coordinates of same points of the modified pattern.

As in the classic system, for the modification of the basic patterns in order to get patterns of the presented family models, the following procedure is accomplished:

- the transfer of the frontside pleat to the sideway stitch;
- the guide mark sectioning;
- the accomplishing of the front side model pattern shape.

For processing and assembling the guide-marks, technological shims should be provided depending on the shape of the outline lines, on the assembling type, on the stitch type, on the thickness of the assembled materials, as well as on the rawelling degree of the edges of the assembled guide-marks under wearing out conditions.

For convenience of use and a precise a quick identification of the points, the numerical subscript of the points proper to patterns was kept, (x_i, y_i) , and they became (u_i, v_i) in order to describe the gauge. For example, the technological shim on the sideway stitch is given by the points (u_7, v_7) , (u_8, v_8) and (u_9, v_9) which coordinates are:

$$\begin{array}{lll} u_7 = x_7 + 0.9 & u_8 = x_8 + 1 & u_9 = x_9 + 1 \\ v_7 = y_7 + 0.9 & v_8 = y_8 & v_9 = y_9 - 4 \end{array}$$

In order to determine the coordinates of the pattern points (x_i, y_i) and (u_i, v_i) of the item gauge, a programme has been written which creates a file compatible with the AutoCAD programme pack.

It is important that patterns for any size of the dimensional range might be obtained. That is why the programme contains a file with the basic dimensions used in the designing from size A-I-41 to D-III-58. The dimensions specific to the item can be selected within a range of values and they are introduced at request: e.g. the skirt length can be selected between 50-100 cm.

After selecting the size which the patterns are wanted and the item dimensions, calculations are made regarding the coordinates of the points proper to the basic patterns. The programme gives a number of models, grouped in "families" for which the basic pattern modifications, are mathematically described. In automatically selecting the model, calculations are made regarding the coordinates of the points characteristic for the model and gauge patterns. A file is, thus created which the values of the coordinates (x_i, y_i) and (u_i, v_i) , file which is compatible with the programme AutoCAD.

The file containing the coordinates of the pattern (x_i, y_i) and gauge (u_i, v_i) points, obtained using the present programme, can be easily exploited using for their drawing the programme pack specialized for the AutoCAD system.

The file is read in AutoCAD, on the display being drawn the basic pattern of the selected size, the modifications of the basic pattern according to the model and gauge, respectively.

The drawing on the display can be plotted using a plotter or even a printer.

For the model family selected for exemplification, the model patterns and the frontside gauges obtained with the presented programme are shown in fig.3 a, b, c, d. The backside gauge skirts is presented in fig.4.

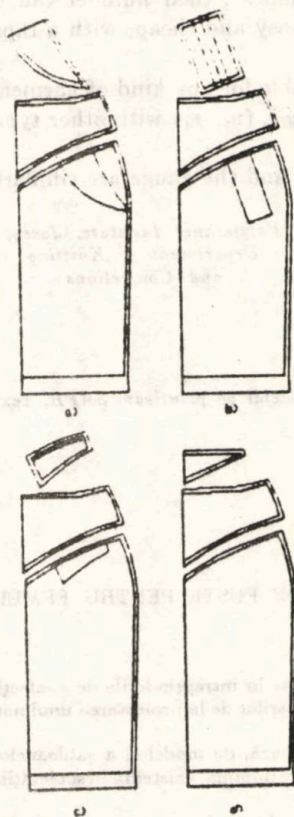


Fig. 3.- Frontside patterns and gauges of skirts.

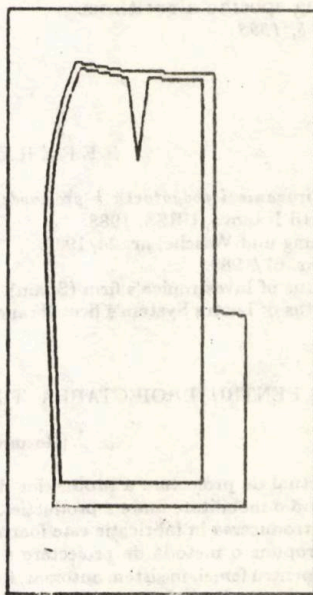


Fig. 4.- Backside pattern and gauge of skirts.

3. Conclusions. Now, many soft&hard producing firms specialized in pattern cutting in the garment industry offer programmes or devices which are able to elaborate the model patterns, or gauges digitally input in the computer memory. Using a data bank with the between dimensional increases, for a number of points of the pattern outline, this one being graded, all sizes of the dimensional range are successively obtained. The quality of the graded patterns is greatly indebted to the operator's experience. The designing automation in the garment field using specialized devices needs big investments, which few Romanian factories can afford.

The proposed programme ensures the accuracy of the designing quality on the operator's experience. Based on the initial selection (body dimension, the

dimension characteristic, to the item and shims and on the algorithm, the basic pattern is each time remade for the respective size considerably reducing the work and keeping up the designing quality).

The models can or can not be grouped in "families", their number can be no matter how great and the information storing is easy and cheap, with a rapid access.

The structure of the programme is easily adaptable for any kind of garment; replacing the algorithm of the skirt coordinates (x_i, y_i) , (u_i, v_i) with other types of garments.

No matter what the item is, the model patterns and the gauge are similarly obtained, using specific algorithms.

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SISTEM CAD PENTRU PROIECTAREA TIPARELOR DE FUSTE PENTRU FEMEI

(Rezumat)

Procesul actual de proiectare a produselor de îmbrăcăminte în întreprinderile de confecții din țară nu asigură o mobilitate mare a producției, iar ciclul lucrărilor de la proiectarea unui nou model până la introducerea în fabricație este foarte lung.

Lucrarea propune o metodă de proiectare a tiparelor de bază, de model și a șabloanelor produsului fustă pentru femei, în sistem automat, folosind o dotare minimă, existentă în societățile comerciale producătoare de confecții textile.

Programul propus asigură obținerea precisă a tiparelor și șabloanelor pentru un număr de modele ale aceluiași produs, pentru orice mărire, evitând dependența calității proiectării de experiența executantului.

BIDIMENSIONAL AND STATISTIC ANALYSIS FOR SOME MAIN ANTHROPOMETRICAL DATA USED IN PATTERN CUTTING

BY

MANUELA ATANASIU and STAN MITU

1. Introduction. The clothes distribution in sizes and heights must be done by the approximate knowing of the frequency of meeting for different morphological types in population.

This distribution in number of sizes and heights must be known not only for the adults, but specially for the youngsters, because they have different rhythms of growing grouped in age classes.

Knowing the results for an unidimensional statistic analysis for the main anthropometric data: height (Ic), and bust (Pb) for a girl sample between 16-18 years old, this paper shows some applications of statistics math in a bidimensional repartition for the same age, and the same number of classes.

2. Method of Work. The estimate of harmonious growing for human body, oblige us to test the existence of some kind of correlation between the height (Ic) and bust (Pb), and to determine the value of this coefficient with this formula:

$$r_{yx} = \frac{n \sum_{i=1}^n x_i \cdot y_i - \sum_{i=1}^n x_i \cdot \sum_{i=1}^n y_i}{\sqrt{\left[\sum_{i=1}^n x_i^2 - \left(\sum_{i=1}^n x_i \right)^2 \right] \cdot \left[n \sum_{i=1}^n y_i^2 - \left(\sum_{i=1}^n y_i \right)^2 \right]}}$$

where: n = means the sample volume ($n=150$); x_i means the private value for the (Ic); y_i - the private value for the (Pb).

We have to ensure if the results are correct (which means that the correlation also exists in the crowd where we've got the sample), we must rest the significance of this coefficient with this formula:

$$t_r = \sqrt{f} \cdot \frac{r}{\sqrt{1-r^2}},$$

where: r means the coefficient of correlation; r^2 - the coefficient of determination; n - the volume of the sample; $f = n - 2$ - the degrees of liberty.

This meaningful value for the correlation coefficient ($r = 0.64$), means the existence of a direct and positive, but medium correlation, because the growing rhythm in height is bigger than the bust one, a characteristic which characterizes the population between 16-18 years old.

We determine then the density or the appearance level for height and bust, with the formula:

$$f(x, y) = \frac{.1}{\sqrt{2\pi\alpha_x\alpha_y}} - \frac{1}{2(1-r^2)} \left[\left(\frac{x_i - \mu_x}{\alpha_x} \right)^2 - 2r \frac{x_i - \mu_x}{\alpha_x} \frac{y_i - \mu_y}{\alpha_y} + \left(\frac{y_i - \mu_y}{\alpha_y} \right)^2 \right]$$

where: $\pi = 3.14$; x_i means the class average for height (Ic); y_i - the class average for bust (Pb); μ_x - the population average for height (Ic); μ_y - the population average for bust (Pb); α_x - the square average of deviation for population, for height (Ic); α_y - the square average of deviation for population, for bust (Pb); r^2 - the coefficient of determination.

You can see the values for this function in Table 1.

Table 1

No.	x_i (Ic) (cm)	y_i (Pb) (cm)	$f(x, y)$ -	No.	x_i (Ic) (cm)	y_i (Pb) (cm)	$f(x, y)$ -	No.	x_i (Ic) (cm)	y_i (Pb) (cm)	$f(x, y)$ -
1.	153	81	0.03360	23.	169	85	0.00890	45.	163	91	0.16140
2.	156	81	0.04950	24.	171	85	0.00220	46.	166	91	0.16140
3.	159	81	0.03980	25.	153	87	0.02200	47.	169	91	0.08430
4.	161	81	0.02460	26.	156	87	0.08880	48.	171	91	0.03970
5.	163	81	0.01160	27.	159	87	0.18810	49.	153	93	0.00030
6.	166	81	0.00220	28.	161	87	0.22160	50.	156	93	0.00360
7.	169	81	0.00020	29.	163	87	0.19950	51.	159	93	0.02020
8.	171	81	0.00003	30.	166	87	0.10300	52.	161	93	0.04530
9.	153	83	0.04600	31.	169	87	0.02900	53.	163	93	0.07750
10.	156	83	0.09170	32.	171	87	0.00890	54.	166	93	0.10480
11.	159	83	0.10140	33.	153	89	0.00890	55.	169	93	0.07750
12.	161	83	0.07750	34.	156	89	0.04740	56.	171	93	0.04530
13.	163	83	0.04530	35.	159	89	0.13740	57.	153	95	0.00003
14.	166	83	0.01220	36.	161	89	0.19960	58.	156	95	0.00050
15.	169	83	0.00180	37.	163	89	0.22160	59.	159	95	0.00420
16.	171	83	0.00003	38.	166	89	0.15670	60.	161	95	0.01150
17.	153	85	0.03980	39.	169	89	0.06050	61.	163	95	0.02450
18.	156	85	0.11110	40.	171	89	0.02290	62.	166	95	0.04560
19.	159	85	0.17010	41.	153	91	0.00220	63.	169	95	0.04640
20.	161	85	0.16210	42.	156	91	0.01620	64.	171	95	0.03350
21.	163	85	0.13750	43.	159	91	0.06490				
22.	166	85	0.04370	44.	161	91	0.11710				

Knowing these results, we can plot the adequate frequency curve for the continuous relations, which winding is called G a u s s' Bell (Fig. 1). We can notice that the maximum value of the function corresponds to the subjects who have average values for I_c and P_b , a specific feature for a sample observing a normal and bidimensional G a u s s - L a p l a c e distribution law.

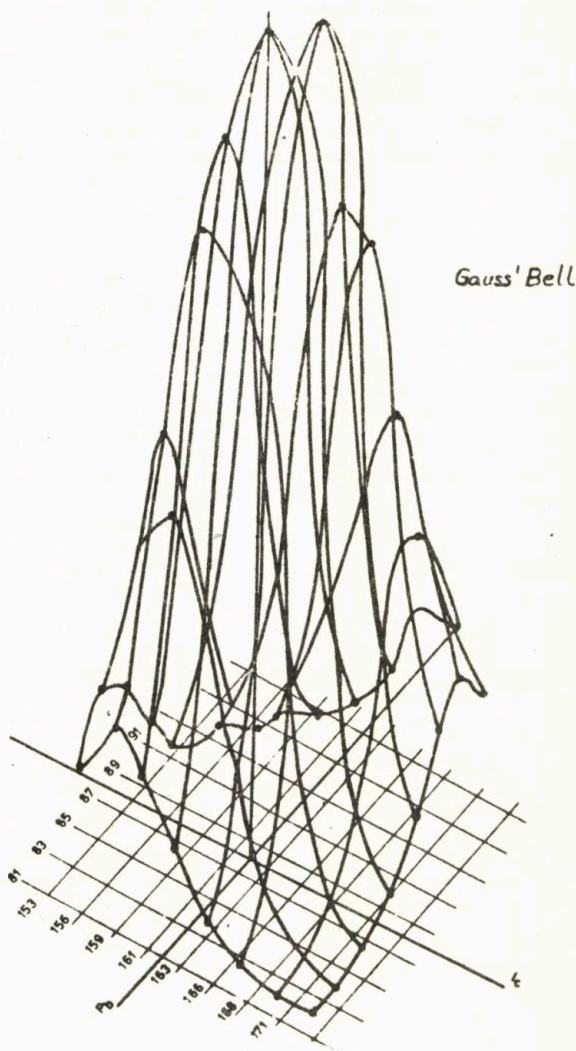


Fig. 1

3. Conclusions. These results which were obtained after the bidimensional statis-

tic analysis, allow some conclusions, such as:

- the correlations which can be established between different anthropometric data, allow filling in and updating of anthropometric standards, because it's useful for our industry to have more information about the body type;

- this analysis of the sample must be done not only from a bidimensional point of view; it's indicated to try a multidimensional analysis, because it will help to get more information concerning the human shape;

- the framing of this sample in a normal and bidimensional G a u s s - L a p l a c e repartition, will help us in establishing the sizes and heights, the structure of a garment production, ensuring the population's needs in this way.

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PRELUCRAREA STATISTICĂ BIDIMENSIONALĂ A INDICATORILOR ANTROPOMETRICI PRINCIPALI NECESARI PROIECTĂRII ÎMBRĂCĂMINTEI

(Rezumat)

Utilizând rezultatele prelucrării statistice asupra mărimilor antropometrice care caracterizează corpul tip (Ic, Pb), la o selecție de sex feminin între 16-18 ani, în studiul repartiției bidimensionale, se ajunge la concluzia că și subiecții din această grupă de vârstă se încadrează într-o repartiție bidimensională G a u s s - L a p l a c e.

Prin determinarea maximului funcției care exprima analitic această lege, precum și a frecvenței de întâlnire a diferitelor combinații de mărimi principale (tipuri morfologice) se obțin informațiile necesare programării pr criterii științifice a structurii de producție a unei societăți comerciale.

DRILLING MACHINE-ATTACHABLE DEVICE WHICH ALLOWS THE FASTENING OF THE SCREWING NUTS FOR THE STUDS USED IN FOOTBALL SHOES

BY
DAN FLORIN CROITORU

1. Technology of Accomplishing the Studs-Equipped Shoes. The shoes used in football games are characterized by the usage of a sole presenting on its wearing surface a certain number of studs. Nowadays, the sole for these shoes are usually made up of thermoplastic polymers, so that there exist two technological possibilities in what the accomplishing and mounting of studs on the sole are concerned:

- a) the accomplishing of a monolith-sole at which the studs form an integral part of the sole;
- b) the accomplishing of a sole without studs, these being subsequently mounted on the sole which has been already fixed on the shoes.

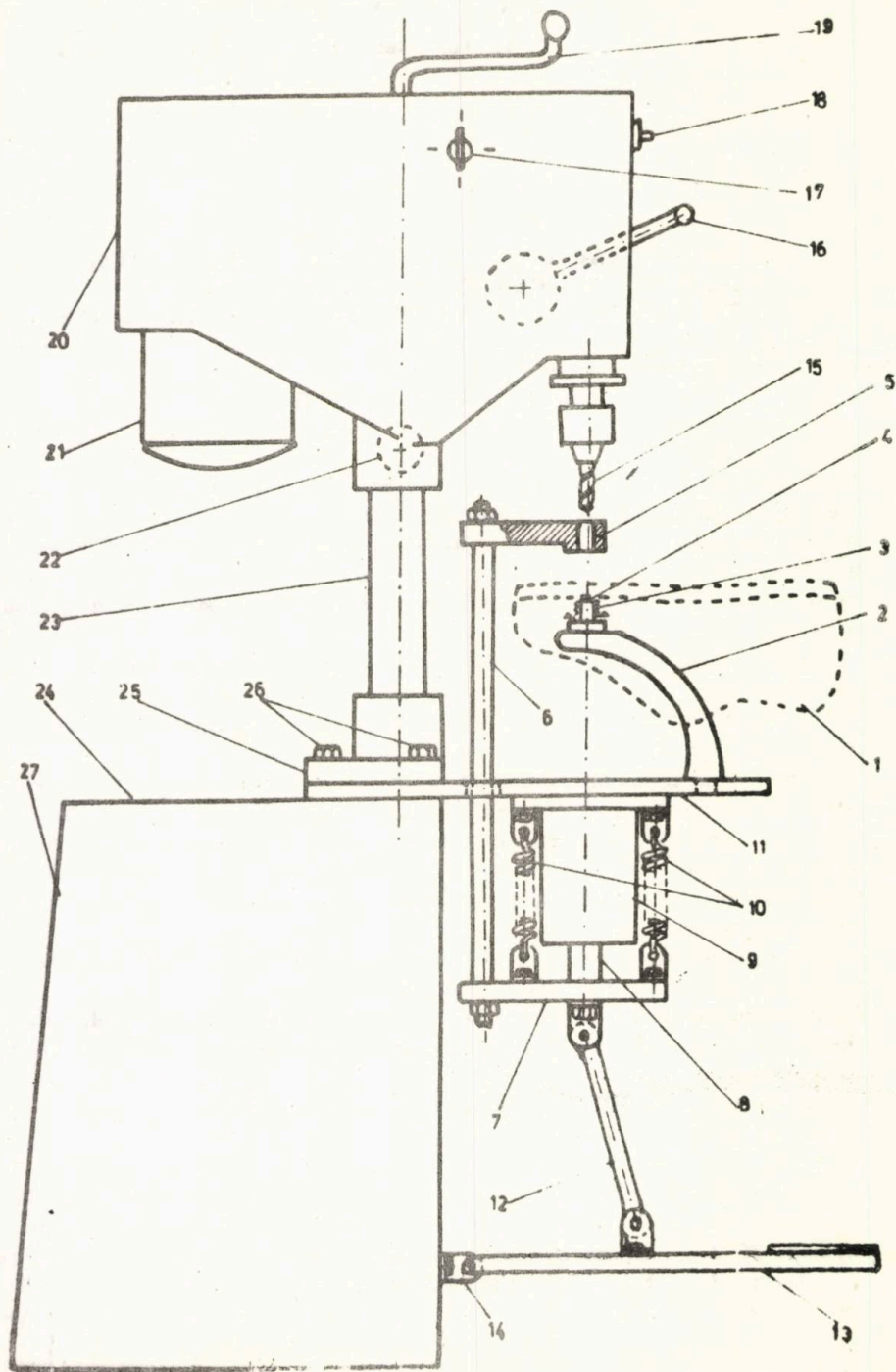
The second technological variant has a series of advantages which have led lately to its generalization. Anyway, this variant implies the fastening on the inner sole - sole assembly of the finite shoe of some special nuts equipped with anchoring fangs in the inner sole for the subsequent screwing of the studs. The fastening of these nuts implies a certain amount of manual operations which make this method become an expensive one.

This paper proposes a device which can be attached to a drilling machine, thus making possible the mechanical fastening of these nuts.

2. Description of the Drilling Machine-Attachable Device Which Allows the Fastening of the Studs Screwing Nuts. This device is made up of three main parts, namely:

- a) the device itself, formed only from mechanical elements;
- b) the hydraulic driving system;
- c) the electric driving system.

The constitutive elements of the device itself (Fig. 1) are mounted on a plate 11 which is fastened between the sole 25 of the vertical shaft 23 - which supports the head 20 of the drilling machine - and the holder 27 by means of the screws 26. The fastening of the plate 11 is made at the rear of the machine so that the head 20 should be rotated with 180 degrees, for this purpose the device 22 of the



machine being used. Thus, the working surface of the machine 24 remains free, the operator being able to re-use the machine according to its initial destination without any need to dismount the device.

The device itself contains the following component parts:

- a) the horn-shaped holder 2;
- b) the bolt 4 to support the nut;
- c) the presser bar 5 of the shoe equipped with a hole through which the drill 15 of the drilling machine can penetrate.

The presser bar 5 is fastened to the upper side of a rod 6 fixed in its turn by a connecting bar 7 to the translating device 8 of a hydraulic cylinder 9. The springs 10 tend to maintain the presser bar 5 to its upper limit position. At the same time, the translating device 8 of the hydraulic cylinder is in a permanent connection by means of the connecting rod 12 with the foot lever 13 which is articulated to the holder 27.

Therefore, it results that the presser bar 5 can be lowered either by pressing the foot lever 13 or by driving the hydraulic cylinder 9.

The operation is carried out as follows:

- a) the nut 3 is put with its fangs upward on the bolt 4;
- b) the shoe 1 is mounted on the holder 2;
- c) the foot lever 13 is pushed down so that the presser bar 5 should press the shoe on the holder;
- d) the hand lever 16 is manipulated so that the driller 15 should penetrate the sole - inner sole assembly;
- e) the hand lever 16 is got loose and the drill 15 returns to its initial position;
- f) the keybutton 18 belonging to the electric driving system is pressed; thus, the translating device of the hydraulic cylinder descends determining the forced penetration of the nut 3 into the hole just created, the fangs sinking into the inner sole;
- g) the shoe is taken off the holder, a new nut is put on the bolt 4, the nut being fixed in the same way in another place on the shoe sole.

All the nuts having thus been fixed on the respective shoe, the studs are to be screwed either manually - with a hand spanner - or mechanically - with the usual screwing machine.

The hydraulic driving system (Fig. 2) is made up of: oil tank 1, low-pressure oil filter 2, oil pump 3, electrically-driven distributor 4 (with two position, four channels, preferential position), overpressure valve 5, gauge 6, simple action hydraulic cylinder 7 (noted with 9 in Fig. 1).

The electrical driving system of the device (Fig. 3) is made up of the following parts: the tripolar contactor with protective relay 1 (equipped with a starting keybutton b_1 and a stopping keybutton b_2); the electromotor 2 which drives the oil pump noted with 3 in Fig. 2; the electric transformer 3; the winding of the electromagnet 4 which takes off from the preferential position the distributor noted with 4 in Fig. 2; the normally-opened contact 5 which is closed by pressing the keybutton noted with 18 in Fig. 1.

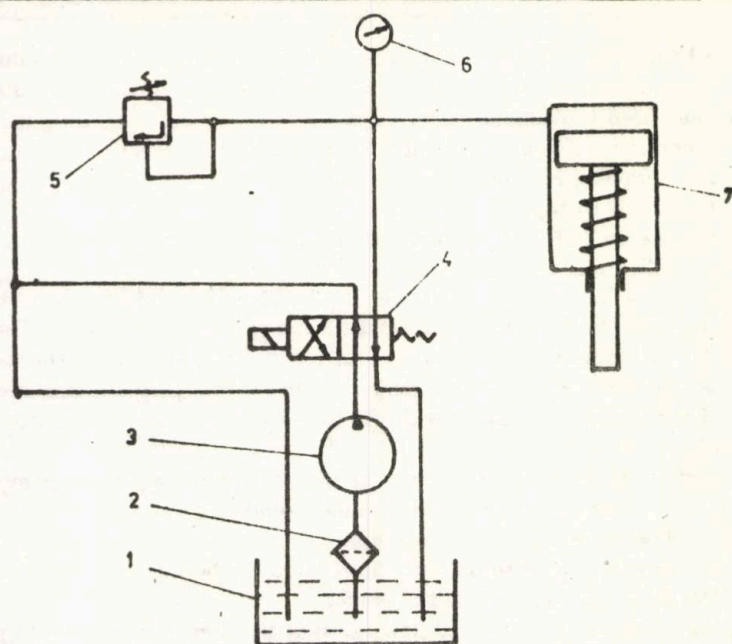


Fig. 2

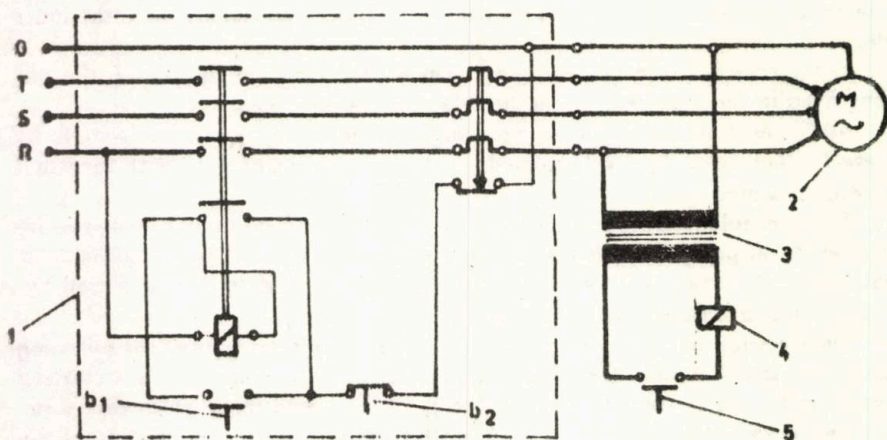


Fig. 3

The component elements of the electric driving system as well as those of the hydraulic driving one (the hydraulic cylinder excepted) can be mounted inside the holder of the drilling machine.

3. Conclusions. a) As a result of the experimental checking up of the device proposed in this paper, a three-times reduction of the mounting time of the studs on the shoe has been registered as compared with the usual methods;

b) As the suggested device ensures a corresponding positioning of the shoes during the penetration operation, the risk of wastes of some semi-manufactured goods is being eliminated;

c) The proposed device has a simple construction and, therefore, it can be accomplished with the means existing in the mechanical work-shop of any shoe factory.

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DISPOZITIV ATAȘABIL LA MAȘINA DE GĂURIT PENTRU FIXAREA PIULIȚELOR DE MONTARE A CRAMPOANELOR LA ÎNCĂLȚĂMINTEA PENTRU FOTBAL

(Rezumat)

Montarea crampoanelor prin înșurubare la încălțăminte pentru fotbal se face prin utilizarea unor piulițe speciale.

În cadrul lucrării este prezentat un dispozitiv electrohidraulic, atașabil la o mașină de găurit, cu ajutorul căruia se fixează piulițele în ansamblul talpă-branț, ulterior efectuându-se înșurubarea crampoanelor.

A METHOD FOR DETERMINING THE BEST NUMBER OF SIZES FOR WOMEN'S FOOTWEAR

BY

GABRIELA MĂLUREANU

1. Introduction. An industrial footwear production, which is destined to a unknown customer, must be based on exact information about the foot dimension: features of the future customer, updated periodically [3].

The manufacturer must know all the range of sizes, which are asked on the market, in order to avoid the accumulation of some inadequate sizes for footwear and also to ensure all the population needs.

The foot dimensional typology for a collectivity must be based on knowledge and analysis of the different morphological types for all kinds of feet; it is also important to know the frequency of occurrence for all these types [1].

2. Having in view these considerations, this paper shows some type-dimension: variants obtained after the analysis of some anthropometrical data of the Romanian women's feet, between 18-57 years of age.

The feet measurements have been made on a representative sample of 450 women from the whole population from this range of age.

So, using as initial data:

- the foot length (Lp);

- the toes perimeter (over the metatarsian phalanx joints) - (Pd)

and the correlation $Pd = f(Lp)$, calculated in paper [4] there has been obtained a simultaneous distribution for each pair of values (Lp , Pd), conditioned by the equation of regression $Pd = f(Lp)$.

Using the method of the smallest square for these two ranges of values (Pd , Lp), which were obtained by measuring the chosen sample, it was possible to determine an equation of regression $Pd = f(Lp)$; after that, through the bidimensional distribution it was possible to plot some parallel sections with planes determined by $Pd = f(Lp)$.

There was used a practical method in determining all the range of sizes and widths, and on establishing a by-dimensional distribution conditioned by the equation of regression, as follows:

- there has been calculated the standard value for the average of the sample for Lp parameter and also for Lp_{standard} :

$$\overline{Lp} = 242.5204 \text{ mm} \quad \overline{Lp}_{\text{standard}} = 245 \text{ mm}$$

By using a mathematical model, as follows

$$Pd = 94.5271 + 0.6040Lp \quad \text{for } \overline{Lp}_{\text{standard}} = 245 \text{ mm}$$

it results for $\overline{Pd}_{\text{standard}}$ an approximate value of 243 mm.

In these conditions, for $\overline{Lp}_{\text{standard}}=245$ mm, we adopt $\overline{Pd}_{\text{standard}}=243$ mm as a central value for a bi-dimensional distribution and also as a generating basis for the center values of Pd classes both for the horizontal and vertical direction in the graph of bi-dimensional distribution.

It has to be mentioned, that in all estimations (calculations) of the limits for these ranges (Pd , Lp) and for the center values for these classes, we have already analysed those results which were obtained by using the mathematical models of correlation [4].

With this study (analysis) [4], there has been established the increasing value from a size to the next size for Pd parameter ($\Delta Pd = 3$ mm) the straight line of regression.

Because all the Lp values are on the same level as the Pd values, knowing the method of work for the Pd parameter, for a bi-dimensional distribution, it is possible to adopt the increasing value for Pd as lines situated (located) at equal distances from the central line of the equation of regression $Pd = f(Lp)$, as a total value ($\Delta Pd = 5$ mm). This way offers the possibility of dividing the Pd range values into classes, in the same area, with a ratio of ± 2 mm from the central value (the ratio was established in the conditions we have already discussed).

Starting with the pairs of standardized average values ($\overline{Lp}_{\text{stand.}}=245$ mm; $\overline{Pd}_{\text{stand.}}=243$ mm) and using the increasing values ($\Delta Lp = 5$ mm; $\Delta Pd = 3$ mm) along the straight line plot by the equation of regression and with $\Delta Pd = 5$ mm on the equidistant lines in a transversal way there has been obtained the network of standardized values for each pair (Lp , Pd) from the sample.

After that, there have been calculated the absolute frequencies for each bi-dimensional interval ($Lp \div Lp + \Delta Lp$; $Pd \div Pd + \Delta Pd$); for each parallel section with the central line and also for each standardized foot length, there was also calculated the sum for these absolute frequencies (Table 1).

For each bi-dimensional interval, the partial relative frequency (in percentage %) was determined by dividing the absolute frequency of the each interval to the sum of the absolute frequency for the Pd range of values (Table 2).

After that, it the absolute and relative frequencies were also calculated for the same bi-dimensional interval, by dividing each absolute frequency to the volume of the sample (Table 3).

In Tables 1, 2, 3, there are conventionally marked the central lines of this conditioned distribution, as well, as the value line for the Pd parameter: $Pd_{\text{stand}} = f(\overline{Lp}_{\text{stand}})$ therefore the line which sum up the absolute and relative central frequencies of the G u s s' Bell with same deviations from the maximum value of frequency; this situation is possible to be met when a sample is analysed from the point of view of a bi-dimensional distribution.

Table 1

fa L_p P_d	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300
12									188	191	194	197	200	203	206						
16								190	193	196	199	202	205	208	211						
17								195	198	201	204	207	210						222		
73						191	194	197	200	203	206	209	212	215	218				227		
58						1	1	1	11	15	13	14	8	7	1				1		
192						196	199	202	205	208	211	214	217	220	223	226					
315						1	1	3	5	11	13	10	6	6	1	1					
210						201	204	207	210	213	216	217	222	225	228	231	234	237			
406						3	2	2	32	36	45	20	31	11	7	1					
330						206	207	212	215	218	221	224	227	230	233	236					
623						7	9	44	34	80	42	53	21	15	2	6					
631						208	211	214	217	220	223	226	227	232	235	238	241				
319						1	3	14	16	55	26	40	28	17	8	1	1				
420						210	213	216	219	222	225	228	231	234	237	240	243	246			
225						1	2	6	26	52	77	74	69	48	34	12	3	2			
297						212	215	218	221	224	227	230	233	236	237	242	245	248	251		
208						1	3	2	11	18	48	60	66	44	50	16	7	1	3		
71						220	223	226	229	232	235	238	241	244	247	250	253				
61						1	5	21	44	130	89	160	76	59	22	10	5				
22						225	228	231	234	237	240	243	245	247	252	255	258	261	264	270	273
8						5	10	29	69	72	134	119	108	43	19	13	3	3	1	1	
5						227	230	233	236	239	242	245	248	251	254	257	260	263	266		
						2	2	12	17	33	64	49	64	37	19	13	4	1	2		
						232	235	238	241	244	247	250	253	256	259	262	265	268			
						3	5	9	26	48	71	84	72	47	30	16	6	2			
						237	240	243	246	249	252	255	258	261	264	267	270				
						2	6	5	14	34	39	40	36	21	21	5	1				
						242	245	248	251	254	257	260	263	266	269	272	275	278			
						4	3	6	25	51	50	70	40	34	9	3	1	1			
						247	250	253	256	259	262	265	268	271	274	277	280				
						1	5	18	21	23	41	29	35	17	11	6	1				
						258	261	264	267	270	273	276	279								
						6	7	15	18	7	13	3	2								
						257	260	263	266	269	272	275	278	281	284						
						2	1	1	7	3	17	16	5	6	2						
						268	271	274	277	280			286								
						2	2	6	3	5			2								
						273	275	279	282	285	288	291									
						1	5	3	3	6	3	1									
						281	284	287		293											
						1	1	5		1											
						280	283	286		295	298										
						1	1	1		1	1										
fa L_p	1	2	15	34	75	208	401	674	807	856	631	431	230	109	30	22	3	4	1	1	0

Table 3

% L_p	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295
.265										188	191	194	197	200	203	206				
										.022	.044	.066	.022	.066	.022	.022				
.353									190	193	196	199	202	205	208	211				
									.022	.022	.066	.110	.022	.022	.022					
.375									195	198	201	204	207	210				222		
									.044	.044	.066	.022	.132	.044				.022		
1.61						191	194	197	200	203	206	209	212	215	218			227		
						.022	.022	.022	.243	.331	.237	.309	.175	.154	.022			.022		
1.28						195	199	202	205	208	211	214	217	220	223	226				
						.022	.022	.066	.110	.243	.287	.220	.132	.132	.022	.022				
4.23						201	204	207	210	213	216	219	222	225	228	231	234	237		
						.066	.044	.044	.705	.794	.992	.441	.683	.243	.154	.022	.022	.022		
6.94				200		206	209	212	215	218	221	224	227	230	233	236		242		
				.022		.154	.198	.970	.750	1.76	.926	1.17	.463	.331	.044	.132		.022		
4.63					208	211	214	217	220	223	226	229	232	235	238	241				
					.022	.066	.309	.353	1.21	.573	.882	.617	.375	.176	.022	.022				
8.95					210	213	216	219	222	225	228	231	234	237	240	243	246			
					.022	.044	.132	.573	1.15	1.70	1.63	1.52	1.06	.750	.265	.066	.044			
7.28				212	215	218	221	224	227	230	233	236	239	242	245	248	251			
				.022	.066	.044	.243	.397	1.06	1.32	1.46	.970	1.10	.353	.154	.022	.066			
13.73	214				220	223	226	229	232	235	238	241	244	247	250	253				
	.022				.022	.110	.463	.970	2.87	1.96	3.58	1.68	1.30	.485	.220	.110				
13.91	219				225	228	231	234	237	240	243	246	249	252	255	258	261	264	270	273
	.022				.110	.220	.639	1.52	1.59	2.95	2.51	2.38	1.06	.419	.237	.066	.066	.022	.022	.022
		227	230	233	236	239	242	245	248	251	254	257	260	263	266					
7.03		.044	.044	.265	.376	.728	1.41	1.08	1.41	.816	.419	.287	.033	.022	.044					
		232	235	238	241	244	247	250	253	256	259	262	265	268			274			
9.26		.066	.110	.198	.573	1.06	1.57	1.85	1.57	1.04	.661	.353	.132	.044			.022			
		237	240	243	246	249	252	255	258	261	264	267	270		276					
4.96		.044	.132	.110	.309	.750	.860	.882	.794	.463	.463	.110	.022		.022					
		242	245	248	251	254	257	260	263	266	269	272	275	278						
6.55		.088	.066	.132	.551	1.12	1.10	1.54	.882	.750	.193	.066	.022	.022						
		247	250	253	256	259	262	265	258	271	274	277	280							
4.48		.022	.110	.237	.463	.507	.904	.639	.771	.375	.243	.132	.022							
			258	261	264	267	270	273	276	279										
1.57			.132	.154	.331	.287	.154	.287	.176	.044										
	251		257	260	263	266	269	272	275	278	281	284								
1.34	.022		.044	.022	.154	.066	.375	.353	.110	.132	.044									
			268	271	274	277	280		286				292	295						
.485			.044	.044	.132	.066	.110		.044				.022	.022						
			273	275	279	282	285	288	291											
.485			.022	.110	.066	.066	.132	.066	.022											
				281	284	287			293											
.176					.022	.022	.110		.022											
			280	283	286			295	298											
.110			.022	.022	.022			.022	.022											
L_p %	.022	.044	.331	.750	1.684	5.98	8.84	14.86	17.79	18.87	13.91	9.50	5.07	2.40	.651	.435	.066	.088	.022	.022

Based on these results from the tables concerning the frequent sizes of the women's foot, between 18-57 years of age, it can be decided over the best number of widths and over the percentage of repetition for Pd values for some particular values for width.

In order to minimize the number of widths, it is possible to produce only 3 types of widths: the central width an neutral interval $\pm 2\Delta Pd$ and two other types (for a narrow and wide foot) which were calculated in the same indifference interval on the parallel and equidistant lines in our graph, because about 2/3 of the values of Pd are on the upper level of the ensemble with a good capacity of adjustment to the foot dimensions (Table 4).

Table 4

Lp	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	Fa	$f_{RQ} \%$
fa	-	-	-	-	-	1	1	1	14	19	25	21	20	13	3	2	-	2	-	-	-	122	2.83
fa	-	-	-	2	3	20	52	117	203	227	209	159	109	52	14	11	1	2	-	-	-	1181	27.34
fa	-	2	6	16	38	88	212	385	416	283	312	201	86	40	12	8	2	-	1	1	-	2109	48.82
fa	1	-	9	15	37	75	116	160	162	129	83	45	14	3	1	1	-	-	-	-	-	851	19.69
fa	-	-	-	1	4	9	10	11	12	5	3	-	1	1	-	-	-	-	-	-	-	57	1.32

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For each kind (type) of width, after we have the results from the bi-dimensional analysis point of view, it is possible to calculate the extension for the range sizes and to sum up the relative frequency in the indifference interval; it was also calculated the particular frequency for these 3 types of width, noticing that the extreme values (the smallest and the biggest) must be added to the known values and it is better to know in this case the frequency for the values which exceed the indifference accepted interval, in order to ensure the whole female population's needs with proper footwear.

Using this method of work, we can calculate the percentage of the subjects who exceed this indifference interval, a very small value (4%), so for about 96% from the whole population it is possible to ensure all the needs with footwear having the interior dimensions proper to the feet dimensions (these results are shown in Table 4). We have to observe that a foot wear production in one value of width in 48,2% the female population's needs and having proper dimensions, can be satisfied.

3. Conclusions. These results which were obtained from a bi-dimensional analysis point of view on some anthropometrical data, make possible the finding out of all foot sizes for the Romanian female population, between 18-57 years of age.

Accepting a ratio of about ± 10 mm when we have determined the limits of the indifference interval, the best number for width as 3 is proposed with the possibility of extending the range sizes for each one, in order to ensure the dimensional comfort of the foot almost 96% of population.

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METODA DE STABILIRE A NUMĂRULUI OPTIM DE
TIPODIMENSIUNI PENTRU ÎNCĂLȚĂMINTEA DE FEMEI

(Rezumat)

În cadrul lucrării s-au stabilit pe baza distribuției normale bidimensionale a parametrilor de bază ai piciorului (Lp , Pd) tipodimensiunile specifice populației de sex feminin din România din intervalul de vârstă 18-57 ani. Acceptând un domeniu de indiferență de ± 10 mm pentru Pd , se propune numărul optim de tipodimensiuni care se concretizează în trei largimi cu extindere diferențiată de mărimi asigurându-se astfel pentru circa 96% din populație încălțăminte cu dimensiuni longitudinale și transversale corespunzătoare.

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METHOD OF ESTABLISHING A HOUSEFLY CULTURE

(Continued)

to obtain a pure culture of houseflies, it is necessary to start with a single pair of flies. The first step is to collect a large number of flies from a source of infestation, such as a garbage can or a stable. These flies are then placed in a container with a small amount of food and water. The container is then sealed and placed in a warm, dark place. After a few days, the flies will begin to lay eggs. The eggs are then collected and placed in a new container with food and water. This process is repeated until a pure culture of houseflies is established.

L'INFLUENCE DES PARAMÈTRES TECHNOLOGIQUES SUR LA CONTRACTION DE LA PELLICULE ADHÉSIVE DANS LE PROCESSUS DE FORMAGE DE LA PELLICULE SOLIDE

PAR

FLORENTINA HARNAGEA

1. Introduction. Le formage de la pellicule solide des solutions adhésives, à la suite de l'élimination du solvant, a lieu par la modification du volume; finalement le volume de la pellicule est constitué par les composants nonvolatiles de la solution. Bien que, théoriquement, cette modification ait lieu dans toutes les directions, en conditions pratiques il n'est pas possible la modification des dimensions au plan de l'interface pellicule-support, parce que la pellicule provient d'un liquide adhérent au support. Donc, la réduction du volume de la pellicule aura lieu dans la direction de l'épaisseur de la pellicule [1].

Au cas de formage de la pellicule sur des surfaces solides, à la suite de l'élimination du solvant, la pellicule solide se trouve en état de tension, état qui est mis en évidence par la suite des modifications dimensionnelles de la pellicule à l'état solide, respectivement par la détermination de la contraction de la pellicule solide.

Un adhésif est d'autant plus pratique, que la capacité de relâchement des tensions est plus grande; donc, tant que la tension rémanente est plus petite, c'est-à-dire celle qui présente la plus petite contraction dans le processus de formage de la pellicule solide [2].

Par le passage de l'état liquide à l'état solide, les adhésifs ont de différents comportements, du point de vue du relâchement des tensions dans le temps, en fonction d'une série de facteurs: la nature de l'adhésif, la concentration initiale de la solution, la vitesse d'élimination du solvant, le temps de formage de la pellicule solide.

Par rapport à ce qu'on a mentionné, dans le travail ci présent, on met en évidence les résultats obtenus à la suite de la recherche de l'influence de la concentration de la solution adhésive et du temps de formage de la pellicule solide, par l'établissement d'un modèle mathématique qui puisse illustrer la liaison entre ces paramètres.

2. La partie expérimentale. Dans le cas des expériences effectuées, on a utilisé deux adhésifs employés couramment dans l'industrie des chaussures à savoir:

- adhésif à base de caoutchouc polychloroprénique - ICPC₃;

– adhésif à base d'élastomères polyuréthaniques – ADEROM 551.

Les déterminations ont été effectuées sur des supports non-déformables étant déposés des volumes égaux d'adhésif à l'aide d'une pompe à injection. Par le processus d'étalement on obtient des pellicules à contour circulaire dont le diamètre a été mesuré à l'aide d'un microscope type MM₁, à une précision de 0,01 mm.

La mesure du diamètre a été faite sur des pellicules adhérentes au support et sur des pellicules écartées du support à des intervalles de temps différents depuis la déposition de la solution.

En vue de l'établissement du modèle mathématique, les expériences ont été programées d'une telle manier que dans volume minimum d'expérimentations on obtient à une maximum d'exigence, les coefficients du modèle mathématique. En ce sens a utilisé l'expériment factoriel de type 2², qui a permis la description du processus par l'équation de régression du type:

$$y = b_0 + b_1x_1 + b_2x_2 + b_{12}x_1x_2 \quad (1)$$

où: y – la variable d'pendante, respectivement la contraction rémanente de la pellicule solide; b_0, b_1, b_2, b_{12} – les valeurs numériques de la constante et des coefficients de régression; x_1, x_2 – les variables indépendantes, respectivement la concentration initiale de la solution et le temps de formage de la pellicule solide.

Les variables indépendantes et leur domaine de variation sont présentées dans le tableau 1.

Tableau 1
Le domaine de variation des variables indépendantes dans des unités réelles (x_n^r) et codifiées (x_i).

x_i		-1	0	+1
x_1^r , %				
la concentration de la solution:	ICPC ₃	14	18	22
	ADEROM 551	13	16	19
x_2^r , jours				
le temps de formage		1	3	5

La matrice expérimentale employée et les valeurs mesurées pour: y_1 – contraction rémanente de la pellicule solide – ICPC₃, %; y_2 – contraction rémanente de la pellicule solide – ADEROM 551 sont présentées dans le tableau 2.

Tableau 2
Matrice expérimentale.

Nr. exp.	x_1	x_2	y_1	y_2
1	+1	+1	0,58	0,26
2	-1	+1	0,78	0,47
3	+1	-1	0,84	0,57
4	-1	-1	1,21	1,10

Le travail des données expérimentale par la voie statistico-mathématique [3, 4] a conduit aux équations suivantes du modèle mathématique proposé:

$$y_1 = 0,85 - 0,14x_1 - 0,17x_2 + 0,04x_1x_2 \quad (2)$$

$$y_2 = 0,60 - 0,185x_1 - 0,235x_2 + 0,08x_1x_2 \quad (3)$$

En vue de la réalisation pratique des équations mentionnées, par le remplacement des variables indépendantes par les valeurs réelles conformément au tableau 1, on obtient les équations suivantes:

$$\text{pour ICPC}_3 \quad y_1 = 1,87 - 0,05c - 0,18t + 0,005ct \quad (4)$$

$$\text{pour ADEROM 551} \quad y_2 = 2,58 - 0,102c - 0,33t + 0,013ct \quad (5)$$

où: c – concentration initiale de la solution adhésive; t – temps de formage de la pellicule solide.

3. Résultats et discussions. La variation de la contraction rémanente de la pellicule adhésive solide en fonction de la concentration initiale de la solution (c) et le temps de formage de la pellicule solide (t) est présentée graphiquement dans la figure 1 pour l'adhésif polychloroprénique et dans la figure 2 pour l'adhésif polyuréthanique.

En analysant les modèles mathématiques obtenus pour chacun de ces deux adhésifs utilisés dans le cadre de l'expérience proposée, ainsi que les représentations graphiques de la figure 1 et 2, on constate:

- Les coefficients des équations de régression, b_1 et b_2 , sont négatifs, illustrant la variation inversement proportionnelle de la contraction rémanente de la pellicule solide par rapport de la variation de la concentration initiale de la solution adhésive et du temps de formage de la pellicule solide. Il résulte: la contraction rémanente de la pellicule adhésive solide baisse à mesure que la concentration initiale de la solution et le temps de formage de la pellicule adhésive augmente.

- La valeur des coefficients b_1 et b_2 est dans la relation $b_1 < b_2$; donc, la variation du temps de formage de la pellicule adhésive solide influence plus fortement que la variation de la concentration initiale de la solution adhésive sur la contraction rémanente de la pellicule solide.

- En fonction de la nature de l'adhésif la concentration initiale et le temps de formage de la pellicule adhésive solide ont résulté des contractions entre 0,26% – 1,2%.

- À partir de la représentation graphique des modèles mathématiques il résulte un comportement différent pour les deux adhésifs. Donc, pour $c = 18\%$, l'adhésif à base de caoutchouc polychloroprénique montre des contractions plus grandes que l'adhésif polyuréthanique. On peut déduire que cette différence est due à la nature et au travail du polymère dans le processus d'obtenir la solution.

- Dans le cadre du même adhésif la contraction diminue avec l'augmentation de la concentration. On doit ce comportement à la différence de perte de volume,

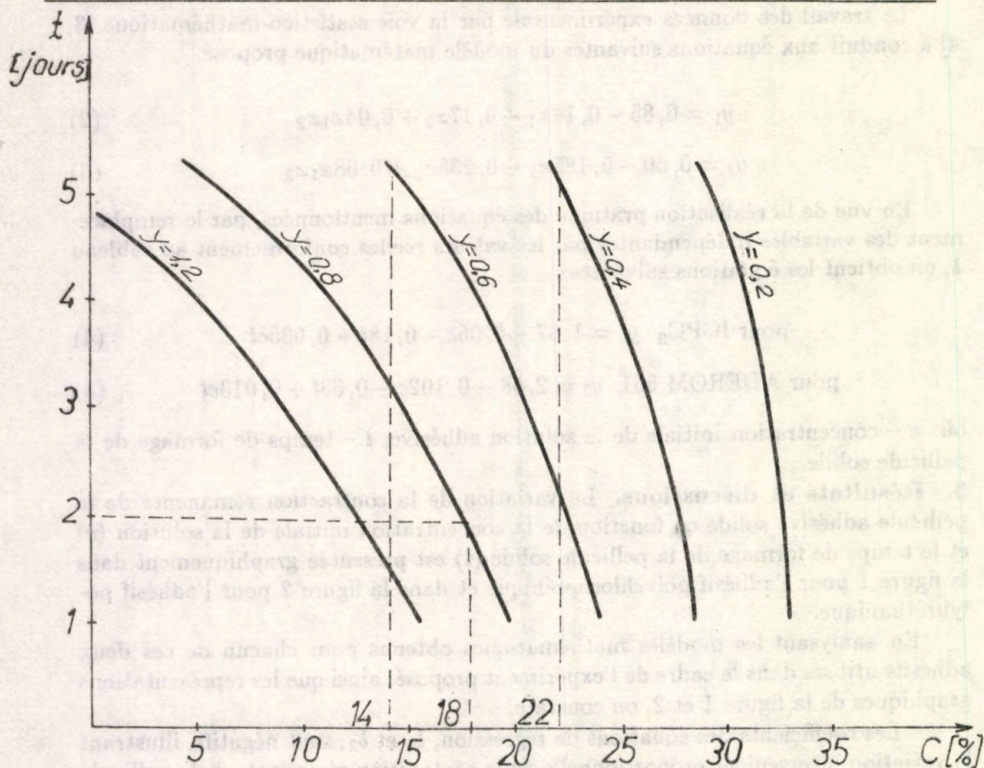


Fig. 1

les solutions adhésives qui perdent une plus grande proportion du volume initial, montre des contractions plus grandes.

4. Conclusions. – Par l'utilisation de l'expérience factorielle de type 2^2 , on réduit le nombre d'expérimentations par rapport aux expérimentations classiques, en obtenant des informations suffisantes, concernant l'effet de l'influence de chaque paramètre et l'effet des interactions.

– Dans le processus de formage de la pellicule solide les deux adhésifs employés à la réalisation de l'expérience programmée présente des contractions réduites après le décollage, donc ils auront un bon comportement dans le processus de l'assemblage par collage.

– L'adhésif polyuréthanique – ADEROM 551, a une meilleure capacité de relâchement des tensions rémanentes existantes dans la pellicule; donc il est supérieur de ce point de vue à l'adhésif à base de caoutchouc polychloroprénique – ICPC₃.

– Puisque les tensions présentes dans la pellicule solide peuvent influencer sur les dimensions du support, en fonction de la capacité de sa déformation par rapport à celle de la pellicule solide, le problème de mesurer la contraction de la pellicule

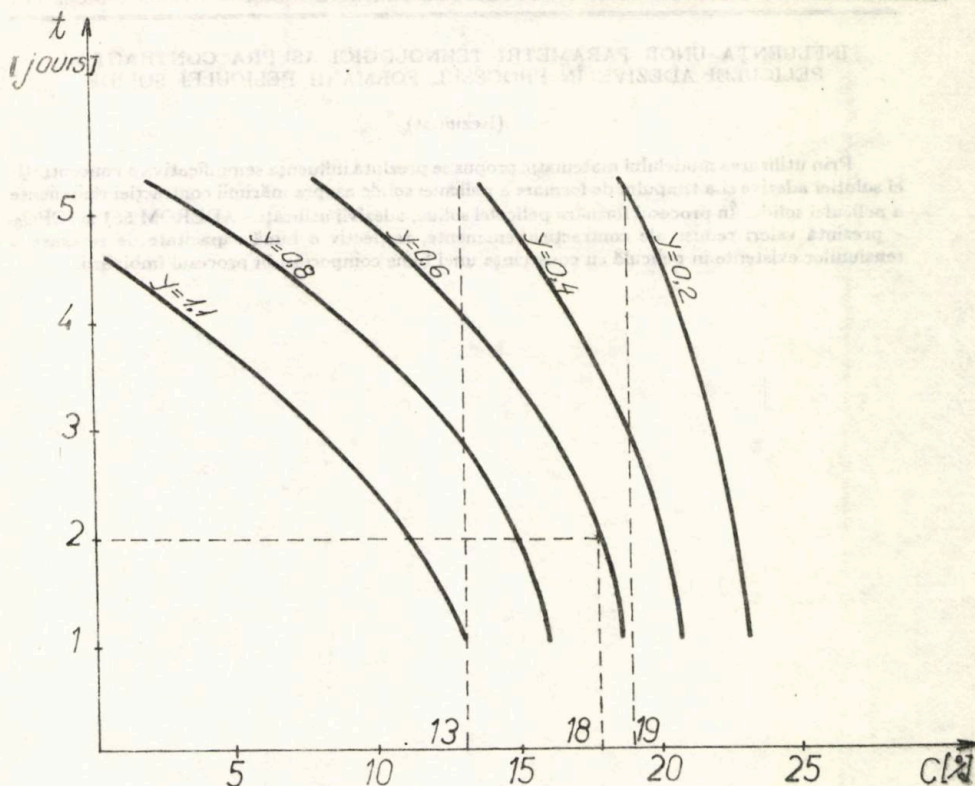


Fig. 2

solide devient important pour l'évaluation du comportement de l'adhésif au collage.

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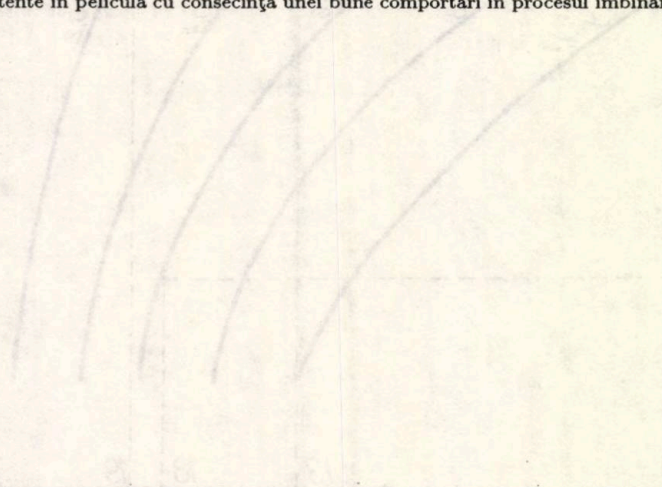
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INFLUENȚA UNOR PARAMETRI TEHNOLOGICI ASUPRA CONTRACȚIEI
PELICULEI ADEZIVE ÎN PROCESUL FORMĂRII PELICULEI SOLIDE

(Rezumat)

Prin utilizarea modelului matematic propus se prezintă influența semnificativă a concentrației soluției adezive și a timpului de formare a peliculei solide asupra mărimii contracției remanente a peliculei solide. În procesul formării peliculei solide, adezivii utilizați – ADEROM 551 și ICPC₃ – prezintă valori reduse ale contracției remanente, respectiv o bună capacitate de relaxare a tensiunilor existente în peliculă cu consecința unei bune comportări în procesul îmbinării.



THE INFLUENCE OF THE DYEING PARAMETERS ON THE COLOR OF TEXTILES

BY

ELIZA LIA PUȘCAȘ

1. Introduction. The color is a sensation which is a part of the appearance of the objects. We consider color to be a composite with three-dimensional characteristics consisting of the lightness attribute and two chromatic attributes which are calling "hue" and "saturation". Since color is three-dimensional, it takes a solid-coordinate system to represent color graphically. The term "color solid" is widely used to identify dimensional arrangement that are usefully related to visual attributes of color [1].

But in the visual perception of the color, standardized conditions must be used in order that such evaluations be reproducible. In spite of all this, there is the variability of color vision among normal observers, and exists a large number of defective observers in the population [2]. The undesirable effects caused by the use of individual observers, or small groups of observers were eliminated by using one of the CIE Standard Observers. The calculation of the tristimulus values in this way is now regarded as the most basic and accurate means of colorimetry.

In the CIE Document of Colorimetry [3], spectral tristimulus values for the 1931 and 1964 Standard Observers are given at every 1 nm throughout the spectrum in terms both of the CIE-X,Y,Z reference stimuli and L^* , a^* , b^* - reference stimuli from which a more uniform chromaticity diagram - called CIELAB space - is obtained.

The derivation of tristimulus values by calculation from spectrophotometric data has become widely used as computers have become more widely available [4].

The separation of luminance from the rest of color information is a basic step and can be seen in most systems. The quotation of L^* related with Y enables luminance to be separated from chromaticity and chromaticity to be expressed on an approximately uniform scale.

The CIELAB parameters are derived from the CIE-X,Y,Z-parameters as follows:

$$\begin{aligned}
 L^x &= 116 \left(\frac{Y}{Y_0} \right)^{1/3} - 16 \\
 a^x &= 500 \left[\left(\frac{X}{X_0} \right)^{1/3} - \left(\frac{Y}{Y_0} \right)^{1/3} \right] \\
 b^x &= 200 \left[\left(\frac{X}{X_0} \right)^{1/3} - \left(\frac{Z}{Z_0} \right)^{1/3} \right]
 \end{aligned} \tag{1}$$

where: X, Y, Z are the CIE-parameters for the measured sample, and X_0, Y_0, Z_0 are the CIE-parameters for the standard illuminant [5].

If L^x, a^x, b^x are plotted along three axes at right angles to one another, a color Solid is obtained - named the CIELAB-space (fig.1).

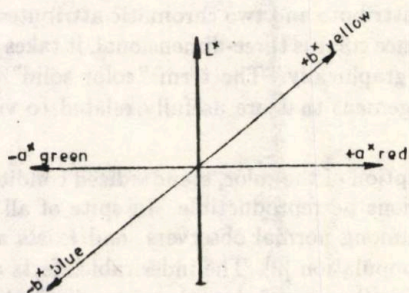


Fig. 1.- The CIELAB color-space

2. Purpose of the work. The work is intended for the evaluation of the tinctorial behaviour of some direct dyes and the determination of dye-contents in the residual dyebaths by means of color-measurements on textile samples dyed under prescribed conditions.

3. Experimental work. Dyeing are prepared using the cotton material and CI Direct Orange 26, according the exhaustion procedures of dyeing and they were carried out with a series of dye-concentration, liquor-rate, time and electrolyte-concentrations.

In the residual baths were made other series of dyeings.

A "MOMCOLOR" colorimeter was used for the measurement of the colour of the dyed samples.

The L^x, a^x, b^x -CIELAB values were computed from the colorimetric measurements and the actual colours were plotted in the $a^x b^x$ -diagram as functions of the dyeing parameters.

4. Results and discussions. The dyeing conditions with the CI Direct Orange 26 and the values obtained for the L^x, a^x, b^x -parameters calculated according to

Table 1
Effect of dye-concentration on the color-parameters

Nr. crt.	Conc. of dye, %	L^x	a^x	b^x	ΔE
1.	1.6	58.83	47.20	48.44	8.46
2.	0.5	76.95	18.32	25.68	48.41
3.	0.2	78.00	7.04	14.26	16.02
4.	2.0	56.63	49.04	50.20	5.42
5.	1.0	75.87	20.75	28.71	44.67
6.	0.8	77.83	8.08	15.85	61.30
7.	2.0	55.03	50.77	51.02	3.35
8.	1.2	72.04	26.73	32.58	36.61
9.	0.7	76.91	10.68	19.39	57.09
10.	2.2	55.08	49.29	48.90	4.18
11.	0.6	71.76	27.41	33.80	35.42
12.	0.25	75.41	12.53	21.62	53.91
*) 13.	2.5	52.00	51.86	50.11	0.00
14.	1.3	67.50	32.25	36.94	28.26
15.	0.5	73.85	14.56	23.47	50.77

*) The standard dyeing: 2.5% dye; 10% neutral electrolyte; Liquor-ratio 1:20; Time of dyeing: 30 min.

Table 2
Effect of concentration of neutral electrolyte on the color-parameters

Nr.	Conc. of electr., %	Conc. of dye, %	L^x	a^x	b^x	ΔE
*) 1.	10.00	2.5	52.00	51.86	50.11	0.00
2.	10.00	1.3	67.50	32.25	36.94	28.26
3.	10.00	0.5	73.85	14.56	23.47	50.77
4.	15.00	2.5	50.76	53.15	50.68	1.88
5.	15.00	1.0	66.16	29.25	37.10	29.68
6.	15.00	0.3	71.30	16.69	30.69	44.54
7.	20.00	2.4	49.98	51.87	50.28	2.03
8.	20.00	0.9	70.57	23.14	31.91	38.74
9.	20.00	0.3	76.94	11.55	20.76	55.58

*) The standard dyeing: 2.5% dye; 10% neutral electrolyte; Liquor-ratio: 1:20; time of dyeing 30 min.

eq. 1 are presented in the tables 1...4.

In every table there are some data concerned the dyeing samples from the start dyebath and the others concerned the samples dyed in the residual dyebath.

The data provided from the tables 1...4 are plotted respectively in figs. 2...5. When these figures are considered, it can be seen that every colour has a relative place in the $a^x b^x$ -chromatic diagram according to the various dyebath conditions.

In the Fig. 2 the points 1, 4, 7, 10 and 13 provide data upon the colours

Table 3
Effect of the liquor-ratio on the color-parameters

Nr.	Liquor-ratio	Conc. of dye, %	L^*	a^*	b^*	ΔE
*) 1.	1:20	2.5	52.00	51.86	50.11	0.00
2.	1:20	1.3	67.50	32.25	36.94	28.26
3.	1:20	0.5	73.85	14.56	23.47	50.77
4.	1:40	2.9	55.03	52.43	50.58	3.21
5.	1:40	1.3	62.93	43.70	46.62	14.08
6.	1:40	1.0	73.79	25.55	32.73	38.32
7.	1:40	0.6	79.85	13.21	21.59	55.53
8.	1:40	0.3	77.73	9.38	19.60	58.28
9.	1:80	3.0	59.52	49.34	49.60	8.00
10.	1:80	1.7	63.40	46.02	49.46	12.83
11.	1:80	1.4	69.88	35.47	39.95	26.30
12.	1:80	1.2	75.85	23.20	31.81	41.54
13.	1:80	1.0	76.89	19.02	27.46	47.00
14.	1:100	3.0	60.21	49.25	50.17	8.62
15.	1:100	1.6	63.26	44.38	46.28	14.05
16.	1:100	1.3	66.72	37.82	42.39	21.76
17.	1:100	1.1	73.30	29.99	34.73	34.84
18.	1:100	0.9	78.69	14.79	25.59	51.85

*) The standard dyeing: 2.5% dye; 10% neutral electrolyte; Liquor-ratio: 1:20; Time: 30 min.

Table 4
Effect of time of dyeing on the color-parameters

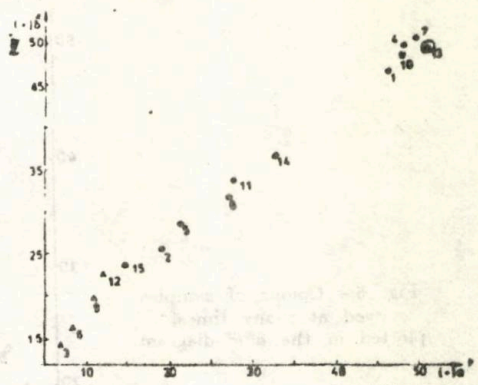
Nr.	Time min	Conc. of dye, %	L^*	a^*	b^*	ΔE
1.	30	2.0	55.03	50.77	51.02	3.35
2.	30	1.2	72.05	26.73	32.58	36.61
3.	30	0.7	76.91	10.68	19.39	57.09
4.	60	2.5	55.52	48.96	49.27	4.63
5.	60	0.7	67.70	23.23	31.66	37.50
6.	60	0.6	80.71	11.67	22.25	56.70
7.	90	2.5	54.97	49.64	49.83	3.72
8.	90	0.9	69.46	29.67	40.16	29.94
9.	90	0.6	80.38	12.10	23.70	55.54
10.	30	2.5	52.00	51.86	50.11	0.00

*) Standard dyeing: 2.5% dye; 10% neutral electrolyte; Liquor-ratio: 1:20.

obtained in the startdye bath at various concentrations. The rest of points corresponds to the colour of the samples obtained in the first and the second residual dye bath.

Fig. 2.- Plot of the color of samples dyed with a series of dye-concentration, in the a^*b^* -diagram:

○ - dyeing in the start dyebath;
 • - dyeing in the first residual bath;
 △ - dyeing in the second residual bath.



The different dyeing conditions have effect on chromatic values of the dyed textile samples.

In a^*b^* -chromatic diagram, the colour differences can be measured by distances between points representing colours, and there is a relationship in size of the ΔE -values presented by a single number in tables 1...4.

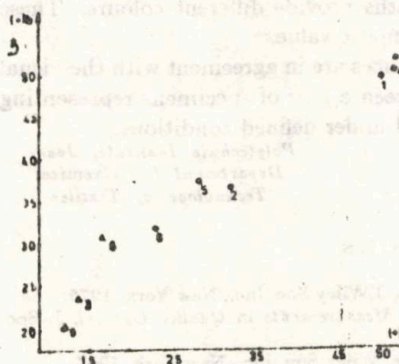


Fig. 3.- Colour of samples dyed with a series of neutral electrolyte-concentration, plotted in the a^*b^* -diagram.

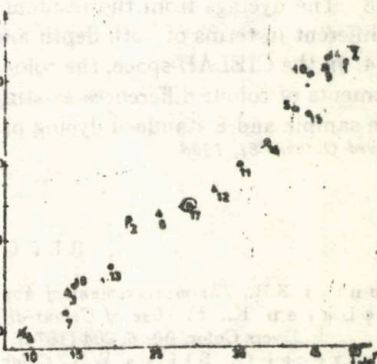
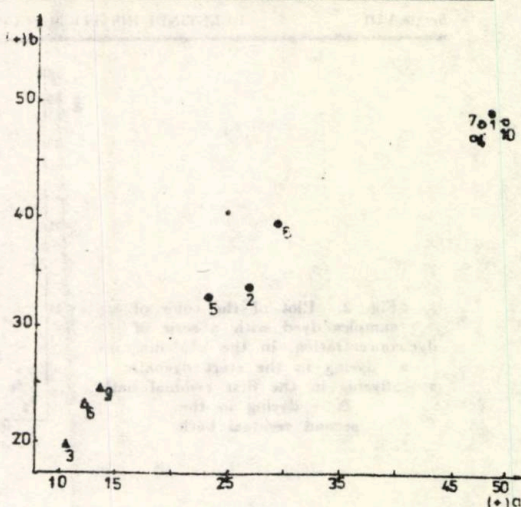


Fig. 4.- Colour of samples dyed at a series of liquor-ratio, plotted in the a^*b^* -diagram.

The figs. 2...5 show that chromatic-values of the textile samples differ from the standard samples to the other samples dyed in starting dyebaths or in the residual dyebaths. The differences are greater when we consider the colours of the dyeings carried out in residual dyebath. These colours are less saturated as the dye-concentration in the residual dyebath is smaller.

5. Conclusions. 1 The dyeing-parameters influence the chromatic-values of the colours obtained with the same dye.

Fig. 5.- Colour of samples dyed at many times, plotted in the a^*b^* -diagram.



2. The plotting of the colours in the CIELAB-solid allows to evaluate the possibility to use the residual dyebaths. This is done by comparing the chromatic-value of the individual dyeings against those of the standards.

3. The dyeings from the residual dyebaths provide different colours. These are different in terms of both depth and chromatic value.

4. In the CIELAB-space, the colour distances are in agreement with the visual assesments of colour-differences existing between a pair of specimens representing a dye sample and a standard dyeing prepared under defined conditions.

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INFLUENȚA PARAMETRILOR DE VOPSIRE ASUPRA CULORII MATERIALELOR TEXTILE

(Rezumat)

Sunt prezentate rezultatele obținute privind aplicarea metodelor instrumentale de măsurare a culorii materialelor textile din bumbac vopsite cu colorantul „Portocaliu direct strălucitor” în diferite condiții. În vederea stabilirii unor procedee de reutilizare a băilor reziduale s-au efectuat vopsiri din aceste băi. Culorile vopsirilor obținute au fost reprezentate în diagrama cromatică a^*b^* aparținând sistemului CIELAB. Poziția culorilor în această diagramă a permis aprecierea influenței diferiților parametri ai vopsirii asupra calității culorii cât și stabilirea caracteristicilor cromatice ale culorilor vopsirilor obținute din băile reziduale.

PHYSICO-CHEMICAL BEHAVIOUR OF SOME CATIONIC DYES IN AQUEOUS SOLUTION

BY

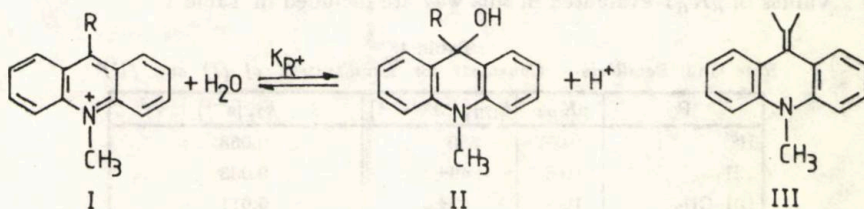
VALERIA-MARTA GORDUZA

1. Introduction. Previous attempts to measure the pK_{R+} values for pseudobase formation from 9-alkyl-10-methyl-acridinium cations (I) were hampered by the limited solubilities of these pseudobases (II) in strictly aqueous media [1].

A further complication arises for those 9-alkyl substituents having hydrogen atoms on the carbon atom that is directly bonded to C-9 of the acridine moiety. In such cases, the formation of an anhydrobase (III) in a deprotonation reaction competes with the hydroxide ion addition reaction to form (II).

It seems that the pseudobase (II) is the kinetically-controlled product from (I) in basic solutions, whereas the anhydrobase (III) is the thermodynamically more stable product.

Thus, attempts to measure equilibrium constants for pseudobase formation from the electronic absorption spectra of equilibrated basic aqueous solution of (I) are frustrated by both limited solubility and a competing reaction.



A solution to overcome these complications is measuring pseudo-first-order rate constants for the approach to the cation-pseudobase equilibrium over the first few half-times of the reaction. Separation of the rate constants for the forward and reverse reactions then allows the calculation of pK_{R+} .

2. Experimental. 9-Alkyl-acridines and 9-phenyl-acridine were synthesized by the high temperature reaction of diphenyl-amine with the appropriate carboxylic acid [2]. These bases were then methylated with dimethyl sulfate and the crude 9-alkyl-10-methyl-acridinium methyl sulfates were converted to the corresponding chloride salts [2].

These chloride salts were recrystallized several times from ethanol and characterized by i.r. spectroscopy.

9-(4-Dimethylamino-phenyl)-10-methyl-acridinium chloride was prepared by refluxing 10-methyl-acridinium chloride with N,N-dimethyl-aniline in ethanol [3].

Rates of cation-pseudobases equilibria were followed spectrophotometrically in aqueous solution (ionic strength 0.1, at 25°C, by mixing a solution of the acridinium cation (within 0.01-0.02 mM) in water with appropriate buffer solutions with a Specord-Carl Zeiss, Jena u.v.-vis. spectrophotometer.

Reactions proved to be kinetically first-order in total acridine cation for at least three half-lives, although deviations from first-order behaviour were observable at longer reaction times, in the slower reactions. These deviations were readily attended either precipitation or anhydrobase formation. In general, constants were obtained by digitizing absorbance vs. time curves.

3. Results. Acridinium cation (I) display an intense electronic absorption spectrum in the vicinity of 360 nm and a series of less maxima in the region 390-420 nm. The corresponding bases (II) show an intense maximum only in the vicinity of the region where (I) only weakly absorbs.

Thus, the rate of equilibration of (I) with (II) can be readily measured by the increase in absorbance with time at 280 nm, or from the decrease in absorbance with time at the region wavelength between 320 and 450 nm.

Decreases in absorption in the region of measure is consistent only with pseudobase formation since the pseudobases show absorption maxima in the vicinity of 400 nm.

The K_{R+} values for the equilibration of (I) and (II) can be calculated:

$$K_{R+} = \frac{[H^+][II]}{[I]} = \frac{K_w[II]}{[I][HO^-]} = K_w k_{OH}/k_2 \quad (1)$$

Values of pK_{R+} evaluated in this way are included in Table 1.

Table 1
Rate and Equilibrium Constants for Equilibration of (I) and (II)^a

R	pK_{R+}	$k_{OH}, [M^{-1}s^{-1}]$	$k_2, [s^{-1}]$
H ^b	10.01	550	0.058
CH ₃	10.8	49±2	0.033
CH ₃ CH ₂	10.3	59±3	0.011
C ₆ H ₅ CH ₂	10.2	50	0.008
(CH ₃) ₂ CH	9.3	7.7±0.5	0.00016
C ₆ H ₅	11.03	1.3	0.0014
4-(CH ₃)NC ₆ H ₄	11.54 ^c	0.69	0.0024

^a in aqueous solution, ionic strength 0.1, 25°C;

^b data from ref. [4];

^c $pK_{R+}=11.51$ from absorbance vs. pH of equilibrated basic solutions.

For (I): R=4-(CH₃)₂NC₆H₄, pK_{R+} was also accesible from the pH dependence of the electronic absorption spectrum of the equilibrated mixture of cation and

pseudobase. The pK_{R+} value evaluated in this way is 11.51 and is in excellent agreement with the value obtained from the kinetic data.

4. Discussion. The pK_{R+} values in Table 1 indicate that, whereas a C-9 methyl, ethyl or benzyl group slightly stabilizes the 10-methyl-acridinium cation towards pseudobase formation, the presence of the more sterically hindered isopropyl substituent at C-9 actually somewhat enhances the thermodynamic stability of the pseudobase relative to the cation. This relative enhancement of pseudobase stability in the 9-isopropyl derivative is not reflected, however, in the rate of hydroxide ion attack to form the pseudobase. Thus, whereas the equilibrium constant for pseudobase formation is 5-fold larger for (I): $R=(CH_3)_2CH$ than for (I): $R=H$, the second-order rate constant for hydroxide ion attack at C-9 is 70-fold larger in the latter case. Although the 9-isopropyl base is the most thermodynamically stable of all the cases in Table 1, its rate of formation is slower than for all other 9-alkyl derivatives.

In general, the values of the k_{OH} in Table 1 decrease with increasing size of the C-9 substituent ($H > \text{primary alkyl} > \text{secondary alkyl} > \text{aryl}$) and are presumably a simple reflection of a steric hindrance to the rate of hydroxide ion attack at C-9.

Values of k_2 show much less order than do those of k_{OH} and it seems clear that it is the k_2 values that are primarily responsible for the unpredictable variation that is found for the dependence of pK_{R+} upon the C-9 substituent.

Variation of the C-9 substituent will most directly influence the stability of (I) via increasingly unfavourable peri interactions between R and the C-1 and C-8 hydrogen atoms as R increases in size.

Such steric interactions are relieved in the pseudobases relative to the cation, and also, somewhat relieved in the transition state for cation-pseudobase interconversion. This phenomenon is quite obvious in the case of the 9-isopropyl derivative, both in the enhanced stability of the pseudobase relative to the cation (lowest pK_{R+}), and also in dramatic reduction in k_2 which reflects the enhanced steric congestion in the transition state relative to the pseudobase.

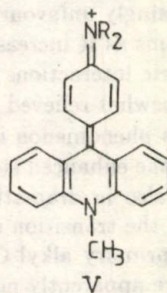
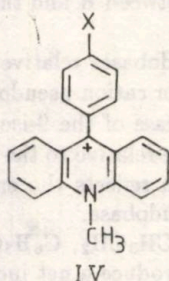
For the primary alkyl C-9 substituents (CH_3 , CH_3CH_2 , $C_6H_5CH_2$) the peri interaction are apparently not sufficiently great to produce a net increase in pseudobase stability relative to the cation when compared with the C-9 unsubstituted species. This suggests that there may be another factor which offsets to some extent influence of the peri interactions in these species. We suggest that such a factor is probably to be found in the solvation requirements of the C-9 hydroxyl group in the pseudobases. The presence of a C-9 alkyl substituent will disrupt the solvation pattern of the hydroxyl group relative to the C-9 unsubstituted pseudobase species, and in so doing will result in a reduced pseudobase stability. Thus, the 9-isopropyl derivative is the only case in Table 1 in which the unfavourable peri interactions in the cation are sufficiently great to completely offset this solvation effect, and therefore produce a net increase in pseudobase stability.

Within the series of methyl, ethyl, and benzyl C-9 substituents, the variations in pK_{R+} and k_2 are probably mainly attributable to differences in the peri interactions of these substituents with H (1) and H (8). The essentially constant value

for k_{OH} for these primary alkyl groups is presumably a reflection of the fact that hydroxide ion attack can occur from either face of the acridine ring system. The sp^3 hybridization of the α -methylene group of a primary alkyl group (RCH_2) will require the R group to lie on one side of the plane of the acridine ring system.

Hydroxide attack from the other face of the acridine plane would encounter a common steric interaction with the methylene group irrespective of the nature of R. The 9-isopropyl substituent can take up a conformation in which both methyl groups are on the same side of the acridine plane. The relatively small reduction in k_{OH} for the 9-isopropyl substituent relative to these primary alkyl groups can then be readily accounted for by hydroxide ion attack on the side away from these methyl groups. The smallest values for k_{OH} are observed for the 9-aryl substituents. These substituents are expected to take up a conformation at a significant angle to the acridine plane and therefore to inhibit attack at C-9 from both faces of the tricyclic system [5].

The 9-phenyl and 9-(4-dimethyl-amino-phenyl) substituents both lead to enhanced cation stability towards pseudobase formation relative to the 9-unsubstituted cation. In these cases, possible contributions from resonance interactions for the stabilization of the cations must also be considered, in addition to the steric interaction and solvation effects considered above for 9-alkyl substituents. Resonance effects are most readily discussed by reference to the canonical structure (IV).

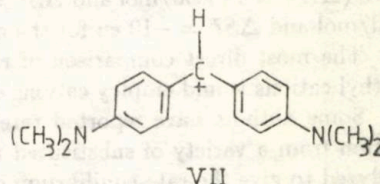
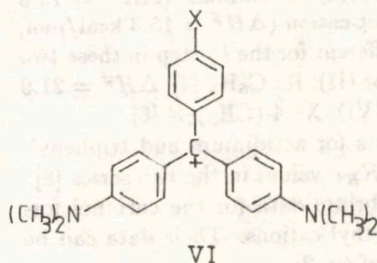


In view of the peri interactions of the 9-aryl substituents with the hydrogen atoms on C-1 and C-8, it is clear that the 9-phenyl ring cannot achieve coplanarity with the tricyclic acridine ring system.

The dipole moment of 9-phenylacridine has been interpreted as requiring an angle of greater than 40° between the planes of the phenyl and acridine rings [5]. Such an angle should allow little overlap between the π -orbitals of the phenyl and acridine systems, and would suggest that there will be little resonance stabilization from the 9-phenyl substituent in (IV). On the other hand, the electronic absorption spectra of 9-(4-amino-phenyl) acridinium cations show pronounced bathochromic shifts relative to 9-phenyl-acridinium cations, and these shifts have been interpreted in terms of resonance stabilization via (V) [2].

The pK_{R^+} values for (IV): $X=H$ and $(CH_3)_2N$ in Table 1 allow a quantitative

evaluation of the importance of the resonance stabilization in these systems. The 4-dimethylamino substituent does show an enhanced stability of the cation relative to the 9-phenyl substituent. However, based upon the observed $\Delta pK_{R+} = 0.5$, this stabilization is only $0.7 \text{ kcal.mol}^{-1}$. This is clearly much smaller than the stabilization of $3.3 \text{ kcal.mol}^{-1}$ ($\Delta pK_{R+} = 2.45$) which is found upon comparison of the relative susceptibilities of the malachite green (VI): $X=H$ and crystal violet (VI): $X=(CH_3)_2N$ cations to carbinol formation [6]. These comparisons, which should be free of solvation and steric influences, indicate that resonance interactions of the 9-aryl groups with the acridine π -system must be quite small. In fact, ΔpK_{R+} for (IV): $X=H$ and $(CH_3)_2N$ is even smaller than the electronic effect of a *para*-dimethylamino substituent upon the pK_a of benzoic acid ($\Delta pK_a = 0.83$ [7]).



It is of interest that $\Delta pK_{R+}=1.0$ for (I): $R=C_6H_5$ and H is of similar magnitude to $\Delta pK_{R+}=1.33$ for (VI): $X=H$ and (VII) [9].

While this comparison might be used to argue for similar resonance interaction of the phenyl substituents with the electron-deficient benzylic carbon atom in these two cases, it seems that steric and solvation effects are unlikely to be negligible in such a comparison, and the similarity in pK_{R+} values in this case is probably fortuitous.

It is of particular interest to compare rate and equilibrium effects upon pseudobase formation from (IV): $X=H$ and $(CH_3)_2N$ with analogous data for the well studied carbinol formation from the malachite green and crystal violet cations. Rate and equilibrium data for these two series of cations are collected in Table 2.

Table 2
Rate and Equilibrium Constants for Hydroxide
Ion Addition to (IV) and (VI)

Cation	X	pK_{R+}	$k_{OH}, [M^{-1}s^{-1}]$	$k_2, [s^{-1}]$
IV	H	11.0	1.3	1.4×10^{-3}
IV	$(CH_3)_2N$	11.54	0.69	2.4×10^{-3}
VI	H ^a	6.94	2.18	1.5×10^{-7}
VI	$(CH_3)_2N^a$	9.39	0.205	4.7×10^{-6}
VI	X ^b	11.0	0.04	4.0×10^{-5}

^a data from [6];

^b rate constants calculated as described in text for a hypothetical cation VI having $pK_{R+} = 11.0$

Despite their unfavourable peri interactions which destabilize the cations relative to the pseudobases, the 9-aryl-10-methyl-acridinium cations are considerably less susceptible towards pseudobase formation than their triphenylmethyl carbocation analogs. This enhanced cation stability in the acridinium system can be attributed to the resonance stabilization that is available in the tricyclic ring system. Consideration of these rate constants for cation-pseudobase equilibrium indicates that, whereas k_{OH} is similar for the 9-arylacridinium and triphenylmethyl cations, k_2 for loss of hydroxide ion from the pseudobase is quite different in these two systems. This comparison can also be extended to the activation parameters for k_{OH} and k_2 reactions. Thus whereas the entropies and enthalpies of activation are similar for hydroxide attack on 9-phenyl-10-methyl-acridinium ($\Delta H^\ddagger = 13.8$ kcal/mol, $\Delta S^\ddagger = -12$ eu [4]) and the crystal violet cation ($\Delta H^\ddagger = 15.3$ kcal/mol, $\Delta S^\ddagger = -10$ eu [6]), these parameters are quite different for the k_2 step in these two cases ($\Delta H^\ddagger = 14$ kcal/mol and $\Delta S^\ddagger = -24$ eu for (II): $R=C_6H_5$ [4]; $\Delta H^\ddagger = 21.9$ kcal/mol and $\Delta S^\ddagger = -10$ eu for the carbinol of (VI): $X=4-(CH_3)_2N$ [6]).

The most direct comparison of rate constants for acridinium and triphenylmethyl cations would employ cations of similar pK_{R+} values in the two series [8].

Some authors have reported rate and equilibrium data for the carbinol formation from a variety of substituted triphenylmethyl cations. Their data can be analyzed to give the rate-equilibrium correlation of eq. 2:

$$\log k_{OH} = -0.40(\pm 0.05)pK_{R+} + 3.0(\pm 0.3) \quad (2)$$

$$(r = 0.965)$$

Equation (2) may be used to estimate that a triphenylmethyl cation of $pK_{R+} = 11$ would have $k_{OH} = 0.04 \text{ M}^{-1}\text{s}^{-1}$. Comparison of this value with $k_{OH} = 1.3 \text{ M}^{-1}\text{s}^{-1}$ for (I): $R=C_6H_5$ indicates that 9-aryl-acridinium cations are 30-fold more reactive towards attack by hydroxide ion than are triphenylmethyl carbocations. The simplest interpretation of this result is probably an indication that, whereas resonance delocalization of charge occurs over all three rings of the triphenylmethyl cations, geometric considerations allow delocalization only within the tricyclic acridine ring system and not to any significant extent into the pendant phenyl ring of the 9-aryl-acridinium cations.

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COMPORTAREA FIZICO-CHIMICĂ A COLORANȚILOR
CATIONICI ACRIDINICI ÎN SOLUȚIE APOASĂ

(Rezumat)

A fost studiată fizico-chimia formării de pseudobaze ale unor coloranți cationici acridinici în soluție apoasă, la modificări ale pH-ului. Constantele fizice au fost determinate printr-o metodă spectrofotometrică.

Proprietățile acido-bazice ale coloranților acridinici în mediu apos au fost comparate cu cele ale unor coloranți bazici trifenil metanici.

Modificările structurale au fost interpretate pe baza considerării extinderii și coplanarității sistemului π conjugat constitutiv.

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A list of names of persons who are known to be active in the
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ANTIFELT FINISHING AND SHRINKPROOFING OF WOOL Part I: TREATMENTS WITH POLYURETHANES

BY

AURELIA GRIGORIU, CARMEN MOROȘAN, ADRIANA GRECU,
C. CIOBANU and GEORGE ERVANT GRIGORIU

1. Introduction. Among the substances used for the "easy care" of wool materials, polyurethanes play a major part.

If considering the structural variety of monomers, on which polyurethanes are based, the latter may be used in uncrease dressing, dimensional stability, "wash-wear" finishing, reducing of the waste materials in spinning mills, obtaining of foams, etc. [1]...[3].

The application of polyurethanes from organic solvents, assures protection from the point of view of the mechanical and chemical characteristics of the wool fiber. In this case is affected only the softness of the wool materials [4]...[5].

The polyurethanes applied on materials from the acid medium, can be introduced prior, after or concomitantly with the dyestuffs [6].

Improvement of the shrink-resistance of wool materials treated with polyurethanes, is due to the interfibers contacts, with elastic connexions [7].

2. Experimental and Discussions. The paper examines polyurethanes with shrink resistance properties, synthesized at the "P. Poni" Institute of Macromolecular Chemistry - Jassy.

Polyurethanes are copolymers of maleic anhydride with acrylic acid, with molecular weight $M = 30\,000$, and $M = 40\,000$ respectively, applied from water solutions (PUR 1 and PUR 2) [8]. They are new products, obtained for the first time here in Romania.

SIRTAM 7003, applied from dimethylformamye 40.6% has been used as control sample.

The polyurethanes have been tested on wool fibres, yarn with $Nm=36/2$, on 100% bleached (190 g/m) and knitted fabrics.

Before the application of polyurethanes on wool materials, the corresponding film was tested on glass (Table 1). The polyurethanes films were dyed with acid dyestuffs. The polyurethanes films are continuous.

The main condition for obtaining an uniform polyurethanes film on wool, is that the superficially tension of these products should be lower that that of wool;

Table 1
Characteristics of polyurethanes films on glass.

No.	Description of film	Time to form the film	Colour of film	Adherence of film on glass
1.	PUR + 0.5% H ₂ O ₂ (35%)	3 days	transparent	-
2.	PUR + 1% NaHSO ₃	4 days	transparent	-
3.	PUR + 0.01% MgCl ₂	1-2 secondes	white	-
4.	PUR + 0.01% Al ₂ (SO ₄) ₃	1-2 secondes	white	-
5.	PUR + 0.01% FeSO ₄	1-2 secondes	brown	-
6.	PUR + 0.01% Zn(CH ₃ COO) ₂	5 secondes	white	-
6.	SIRTAM 7003	5 hours	white	+

that is why pretreatment is recommended, in order to increase wool's critical superficial tension (from 40-50 dyne/cm to 70-80 dyne/cm).

As pretreatment variants mention may be made of Basolan DC (BASF), sodium permonosulphate, potassium permanganate/salt, sodium hypochlorite/salt, sodium bisulphite, sodium hydroxide/salt, steaming, etc. [9].

When applying of polyurethanes is from solvent medium, pretreatments on wool fibre are no longer necessary. The advantage of polyurethane application from organic solvents is that of partial solubilisation of the lipoproteic material (2.5-4% o.w.f.). The analysis performed indicates both the removal of some polar and apolar lipids, and the existence of a relationship between the amount of dissolved proteins and the shrinkproofing effect. The shrink resistance effect is generally attributed to physical and chemical modifications at the cuticular level [10]...[11].

Polyurethanes have been studied as to their concentration, additions, temperature, time, type of pretreatment and possibilities of polymer films consolidation.

The best results obtained, from the view point of fibers shrinkproofing are presented in the Table 2.

Table 2
Shrink-resisting treatments with polyurethanes on wool fibers.

No.	Treatment	Loading degree (%)	Fibre diameter* (μ)	Time of wetting	Felting density** (g/cm ³)
1.	Untreated	-	24	5 days	0.134
2.	Basolan DC+Basolan SW	-8.2	20	20 sec.	0.054
3.	Na ₂ SO ₅ +Basolan SW	10.5	26	58 min.	0.062
4.	KMnO ₄ /salt+5% PUR, MgCl ₂	18.2	25	13 min.	0.073
5.	Na ₂ SO ₅ +5% PUR, MgCl ₂	12.9	28.5	180 min.	0.071
6.	steaming+5% PUR, AlCl ₃	17.9	25.5	30 min.	0.073
7.	steaming+5% PUR, ZnCl ₂	22.4	26	10 min.	0.073
8.	5% SIRTAM 7003	12.9	28	hydrophobic	0.055

* The fibre diameter was determined with Zeiss Lanameter.

** The felting density was determined for a spherical ball, felted in NaH₂PO₄ solution (pH=7), one hour in SCOURTESTER.

In Table 3 some variants of the polyurethanes applications on fibers, for yarns with 100% wool have been selected.

Table 3
Shrink-resisting treatments with polyurethanes on wool threads.

No.	Treatment with polyurethanes	Contraction during the treatment* (%)	Contraction after washing (%)
1.	Untreated	—	13.9
2.	Basolan DC + 5% Basolan SW	33.3	0.3
3.	Na ₂ SO ₅ + 5% Basolan SW	31.6	0.6
4.	NaOCl/salt + 5% PUR, 0,05% MgCl ₂	22.1	0.3
5.	NaOH/salt + 5% PUR, 0,05% MgCl ₂	23.5	0.3
6.	KMnO ₄ /salt + 5% PUR, 0,05% MgCl ₂	23.3	0.3
7.	Na ₂ SO ₅ + 5% PUR, 0,05% MgCl ₂	29.5	0.4
8.	steaming + 5% PUR, 0,05% MgCl ₂	32.6	1.3
9.	5% SIRTAM 7003	12.3	0.1

* 30-40°C, 10-15 minutes

As no satisfactory correlation exists between shrink resistance of yarns and fabrics, some variants applied on yarns, for wool fabrics have been considered (see Table 4 and Table 5).

Table 4
Shrink-resisting treatments with polyurethanes on wool fabrics.

No.	Treatment with polyurethanes	Contraction at relaxation (%)		Contraction at felting process (%)	
		1 hour*	2 hours	1 hour	2 hours
1.	Untreated	25.2	18.1	26.6	19.3
2.	Basolan DC + Basolan SW	6.4	5.3	3.6	2.8
3.	Na ₂ SO ₅ + Basolan SW	11.7	11.7	8.1	7.8
4.	NaOCl/salt + 5% PUR, MgCl ₂	6.3	6.1	5.5	5.2
5.	NaOH/salt + 5% PUR, MgCl ₂	6.5	6.5	4.8	4.1
6.	KMnO ₄ /salt + 5% PUR, MgCl ₂	6.6	3.2	3.6	1.8
7.	steaming + 5% PUR, MgCl ₂	13.7	13.5	12.3	11.9
8.	5% SIRTAM 7003	0.9	0.9	0.8	0.7

* time of washing process

A study of the combined influence of the two variables, i.e. treatment duration and polyurethanes concentration, has been carried out, in order to optimise these variables in terms of the main parameters affected by the treatment, i.e. felting density of wool fibers.

The pretreatment with sodium permonosulphate was finally selected.

Table 5
Shrink-resisting treatments with polyurethanes on knitted fabrics.

No.	Treatment with polyurethanes	Contraction at relaxation (%)		Contraction at felting process (%)	
		1 hour*	2 hours	1 hour	2 hours
1.	Untreated	18.8	17.8	18.1	17.8
2.	Basolan DC + Basolan SW	8.5	7.3	8.4	7.4
3.	Na ₂ SO ₅ + Basolan SW	12.9	12.9	12.8	12.7
4.	NaOCl/salt + 10% PUR, 0.1% MgCl ₂	1.8	1.7	1.7	1.5
5.	KMnO ₄ /salt + 10% PUR, 0.1% MgCl ₂	9.1	9.0	8.7	8.7
6.	Na ₂ SO ₅ /salt + 10% PUR, 0.1% MgCl ₂	9.5	8.7	8.9	8.8
7.	steaming + 10% PUR, 0.1% MgCl ₂	15.3	11.2	14.7	14.2
8.	10% SIRTAM 7003	1.2	0.9	0.9	0.9

* time of washing test

The values of the treatment time and polyurethane concentration, were established according to a central rotatable programme for the two variables.

According to the results of previous more general studies, the range of values (30-1800 seconds) and 3-20% polyurethane concentrations was chosen.

The experimental conditions of the 13 treatments covered by the central rotatable plan, are shown in Table 6.

Table 6
Experimental conditions in wool fibres treatment with polyurethanes.

No.	x_1	x_2	Treatment duration (seconds)	Polyurethanes concentration (%)	Felting density (y) (g/cm ³)
1.	-1	+1	290	17.5	0.058
2.	+1	-1	1540	5.5	0.061
3.	-1	-1	290	5.5	0.075
4.	+1	+1	1540	17.5	0.060
5.	-1.414	0	30	11.5	0.070
6.	+1.414	0	1800	11.5	0.058
7.	0	-1.414	915	3.0	0.073
8.	0	+1.414	915	20.0	0.060
9.	0	0	915	11.5	0.065
10.	0	0	915	11.5	0.064
11.	0	0	915	11.5	0.063
12.	0	0	915	11.5	0.064
13.	0	0	915	11.5	0.064

The regression equation for y corresponds to a second degree polynomial (1):

$$y = b_0 + b_1x_1 + b_2x_2 + b_{11}x_1^2 + b_{22}x_2^2 + b_{12}x_1x_2 \quad (1)$$

where b_0 , b_1 , etc. are constants and x_1 , x_2 are variables (in our case treatment time, in seconds, and polyurethane concentrations, in %).

In a coded form the regression equation for the application of polyurethane PUR1 is the following:

$$y = 0.0632 - 0.00362x_1 - 0.00454x_2 - 0.0000501x_1^2 + 0.001199x_2^2 + 0.004x_1x_2 \quad (2)$$

The minimum for felting density values were obtained for the treatment durations of 30 to 572 seconds and polyurethanes concentration values 18.7 to 20% or for a treatment duration of 1697 to 1800 seconds and polyurethanes concentration of 8.4 to 11.5% (fig.1).

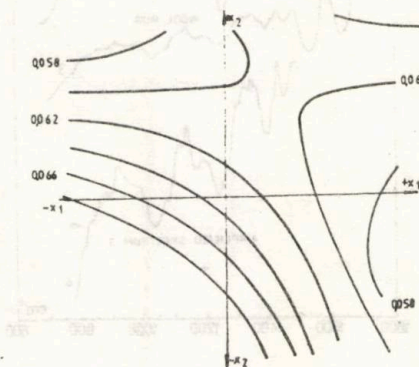


Fig. 1

IR spectra were recorded with IR-SPECORD M80 (Carl Zeiss Jena), using an ATR crystal from KRS-5 (Fig. 2). From the data mentioned in Table 7 it can be explained the interaction between wool and polyurethanes.

Table 7
IR absorption bands for untreated and treated wool

No.	Treatments	Wave number (cm ⁻¹)	Characteristic band	Vibration type
1.	Untreated wool	1640	C=O	valence
		1535	NH	deformation
2.	Wool treated with polyurethanes	1700	CO	valence
		1550	amide II	valence
		1450	-CH ₂	scissoring
		1260	amide III	valence
		1160	C-O-C	valence
		1080	C-O-C	valence

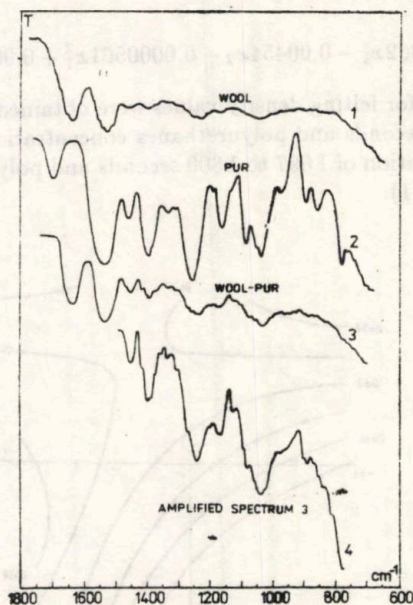


Fig. 2

3. Conclusions. The shrink-resistance treatments employing polyurethanes in water solutions are comparable to that with Basolan SW (BASF), realized on pretreated wool.

The treatments with polyurethanes confer hydrophylic properties to wool materials.

The minimum felting density is obtained for a short treatment duration and high polyurethanes concentration or inversely.

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TRATAMENTE DE NEÎMPÂSLIRE A LÂNII

Partea I: Tratamente cu poliuretani

(Rezumat)

Este analizată îmbunătățirea rezistenței la contracția prin împâslire a materialelor din lână, prin tratarea acestora cu poliuretani (copolimeri ai anhidridei maleice cu acidul acrilic), aplicabili din mediu apos.

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TRATAMIENTOS DEL NEOPRENO A LÁPIZ

Partes I. Tratamiento en polimerización

(Resumen)

Este artículo describe los resultados de los experimentos realizados en el laboratorio de polimerización de neopreno en presencia de un agente de curado. Se describen los resultados de los experimentos realizados en el laboratorio de polimerización de neopreno en presencia de un agente de curado.

ANTIFELT FINISHING AND SHRINKPROOFING OF WOOL

Part II: TREATMENTS WITH POLY (DIMETHYL SILOXANE)- α, ω DIOLS

BY

CARMEN MOROȘAN, AURELIA GRIGORIU, ADRIANA GRECU,
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1. Introduction. The three main mechanisms explaining the improvement of shrink-resistance and wrinkle recovery of wool fabrics treated with silicone polymers are as follows:

- Replacement inter-fibre frictional contacts with elastic connexions, the frictional component impeding fabric recovery being thus removed.
- The presence of surface polymer coatings slows the moisture's diffusion out of fibre in ambient conditions. The resulting lower rate or extent of moisture uptake (or a combination of both) allow better recovery of the fibres, since it is known that abrupt changes in moisture content produce marked transient changes in the elastic properties of wool.
- The polymer is deformed when the fabric is bent, which provides an elastic restoring force that aids recovery. This latter effect may arise from the deformation of the polymeric coating on a single fibre or of the interfibre polymer connexions [1].

The silicone polymers confer hydrophobic and softness properties to wool materials [2].

The disadvantage of silicone polymers application on wool fabrics, is that they become yellow and heavier [3].

The application of silicone polymers on wool involves organic and aqueous solvents.

It was found out that poly (dimethyl siloxane)- α, ω diols are more effective than others, particularly when is used as crosslinking agent benzoperoxide with the formation of siloxane bonds (Si-O-Si), by reaction of terminal silanol groups (Si-OH) [4].

Several patents [5]...[7] describe shrinkresist treatments using high molecular weight poly (dimethyl siloxane)- α, ω diols.

Dow Corning Co. have realized a silicone for wool shrink resistance treatments (DC 109 – 109A or B), possessing excellent properties in this field [8].

2. Experimental and Discussions. The paper examines various factors involved in shrink-resistance wool treatments with poly (dimethyl siloxane) – α, ω diols, of various molecular weights and three silane crosslinking agents.

The following silicones were obtained at the "P. Poni" Institute of Macromolecular Chemistry – Jassy (Table 1) [9].

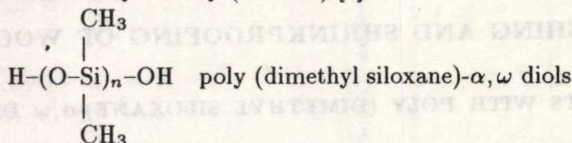


Table 1
Characteristics of siloxanes.

No.	Symbol of siloxane	Viscosity cSt (20°C)	Molecular weight	n approximately
1.	S ₁	4243	52775	713
2.	S ₂	5637	57645	778
3.	S ₃	7549	62877	849
4.	S ₄	9439	67033	905

As silane crosslinking agents it was tested triacetoxymethylsilane (R), without adding catalysts, di (α, α -dimethyl benzyl) peroxide (P₁), whose reactivity was compared to that of benzoperoxide (P₂).

All poly (dimethyl siloxane)- α, ω diols was tested in perchlorethylene (1 ml perchlorethylene for 1 g wool).

Poly (dimethyl siloxane)- α, ω diols films on glass (Table 2) were first analyzed.

Table 2
Characteristics of siloxanes films on glass.

No.	Description of film	Necessary time to form film	Colour of film	The adherence of film on glass
1.	Siloxan + 0.4% P ₁	3 days	white	+
2.	Siloxan + 0.4% P ₂	5 days	transparent	+
3.	Siloxan + 0.5% R	5 days	transparent	+

Poly (dimethyl siloxane)- α, ω diols were tested as to their concentrations, additions, temperature, duration and possibilities of film consolidation:

From the point of view of wool fibers shrink-resistance best results obtained, are presented in Table 3.

For subsequent shrink-resistance yarn (100% wool) treatments, the following variants have been selected (see Table 4).

Table 3

*Shrink-resisting treatments with poli
(dimethyl siloxanes) α, ω diols on wool fibers.*

No.	Treatment*	Loading degree (%)	Fibre diameter (μ)	Time of wetting	Felting density (g/cm^3)
1.	5% S_4 + 0.5% R	44.2	25	hydrophobic	0.030
2.	5% S_4 + 0.5% P_1	36.5	26	hydrophobic	0.032
3.	5% S_4 + 0.5% P_2	39.2	26	hydrophobic	0.031

* the treatment with siloxanes is for 1 minute, at 20°C

Table 4

*Shrink-resisting treatments with poli
(dimethyl siloxanes)- α, ω diols on wool threads.*

No.	Treatments	Contraction during treatment (%)	Contraction after washing (%)
1.	5% S_4 + 0.5% R	16.7	0
2.	5% S_4 + 0.5% P_1	16.6	0
3.	5% S_4 + 0.5% P_2	16.6	0

Table 5

*Shrink-resisting treatments with poli
(dimethyl siloxanes)- α, ω diols on wool fibers.*

No.	Treatments	Contraction at relaxation (%)		Contraction at felting process (%)	
		1 hour*	2 hours	1 hour	2 hours
1.	5% S_4 + 0.5% R	0	0	0	0
2.	5% S_4 + 0.5% P_1	0	0	0	0
3.	5% S_4 + 0.5% P_2	0	0	0	0

* washing time

Table 6

*Shrink-resisting treatments with poli
(dimethyl siloxanes)- α, ω diols on wool knitted fibers.*

No.	Treatments	Contraction at relaxation (%)		Contraction at felting process (%)	
		1 hour	2 hours	1 hour	2 hours
1.	10% S_4 + 1% R	0	0	0	0
2.	10% S_4 + 1% P_1	0	0	0	0
3.	10% S_4 + 1% P_2	0	0	0	0

From all variants presented in Table 4, the best ones were selected, for their application on wool fabrics (Tables 5 and 6).

A study of the combined influence of the two variables, the duration and concentration in treatment with poly (dimethyl siloxane)- α, ω diols has been carried

out, for the optimisation of these variables in terms of the main parametres affected by the treatment, i.e., fibers felting density.

Values of the treatment duration and poly (dimethyl siloxane)- α, ω diols concentrations have been established in accordance with a central rotatable programme for the two variables.

The range of values (30-1800 seconds and 3-20% poly (dimethyl siloxane)- α, ω diols), was chosen, after consideration of the results of previous more general studies.

Table 7 shows the experimental conditions of the treatments covered by the central rotatable plan.

Table 7
Experimental conditions in wool fibres treatment
with poly (dimethyl siloxanes)- α, ω diols.

No.	x_1	x_2	Treatment duration (secondes)	Siloxanes concentration (g/l)	Felting density (y) (g/l)
1.	-1	+1	290	17.5	0.028
2.	+1	-1	1540	5.5	0.029
3.	-1	-1	290	5.5	0.033
4.	+1	+1	1540	17.5	0.029
5.	-1.414	0	30	11.5	0.030
6.	+1.414	0	1800	11.5	0.028
7.	0	-1.414	915	3.0	0.034
8.	0	+1.414	915	20.0	0.029
9.	0	0	915	11.5	0.030
10.	0	0	915	11.5	0.030
11.	0	0	915	11.5	0.030
12.	0	0	915	11.5	0.031
13.	0	0	9156	11.5	0.031

The regression equation for y corresponds to a second degree polynomial (eq. 1). The independent variables are: x_1 - duration of the shrink-resistance treatment with poly (dimethyl siloxane)- α, ω diols and x_2 - poly (dimethyl siloxane)- α, ω diols concentration.

The regression equation for poly (dimethyl siloxane)- α, ω diols application, is given in its coded form, as follows:

$$y = 0.0304 - 0.00072x_1 - 0.0015x_2 - 0.00083x_1^2 + 0.000418x_2^2 + 0.00125x_1x_2 \quad (1)$$

Minimum felting density values were obtained for a treatment duration of 30 to 530.7 secondes and for poly (dimethyl siloxane)- α, ω diols concentration of

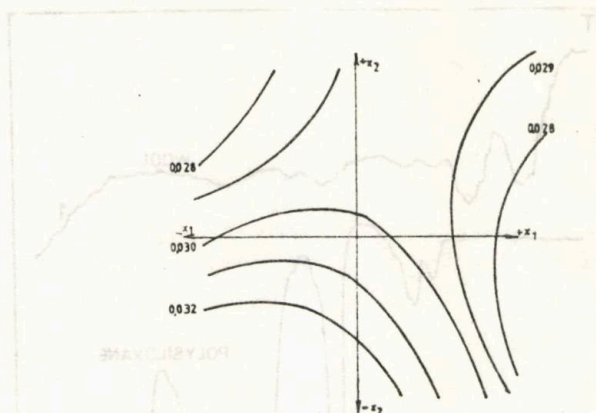


Fig. 1

15.1 to 20% or of 1728 to 1800 seconds and a poly (dimethyl siloxane)- α, ω diols concentration of 4.88 to 14.5% (fig.1).

IR spectra were recorded on IR-SPECORD M 80 (Carl Zeiss Jena) using an ATR crystal from KRS-5 (Fig. 2). From data mentioned in Table 8 it can be explained the interaction between wool and poly(dimethyl siloxane)- α, ω diols.

Table 8
IR absorption bands for untreated and treated wool

No.	Treatments	Wave number (cm^{-1})	Characteristic band	Vibration type
1.	Untreated wool	1640	C=O	valence
		1535	NH	deformation
2.	Wool treated with siloxanes	1260	$(\text{CH}_3)_2$	deformation
		1100	-Si-O-	valence
		860	$(\text{CH}_3)_2$	valence
		800	$(\text{CH}_3)_2$	deformation

3. Conclusions. The best results in shrink-resistance finishes of wool, with poly (dimethyl siloxane) - α, ω diols in perchlorethylene, were obtained when as crosslinking agents triacetoxi methyl silane and di (α, α -dimethyl benzyl) peroxide, without catalysts have been used.

In addition to shrink resistance treatments for wool, hydrophobics, softness and wrinkle recovery were also achieved.

The minimum felting density is obtained for a short treatment duration and

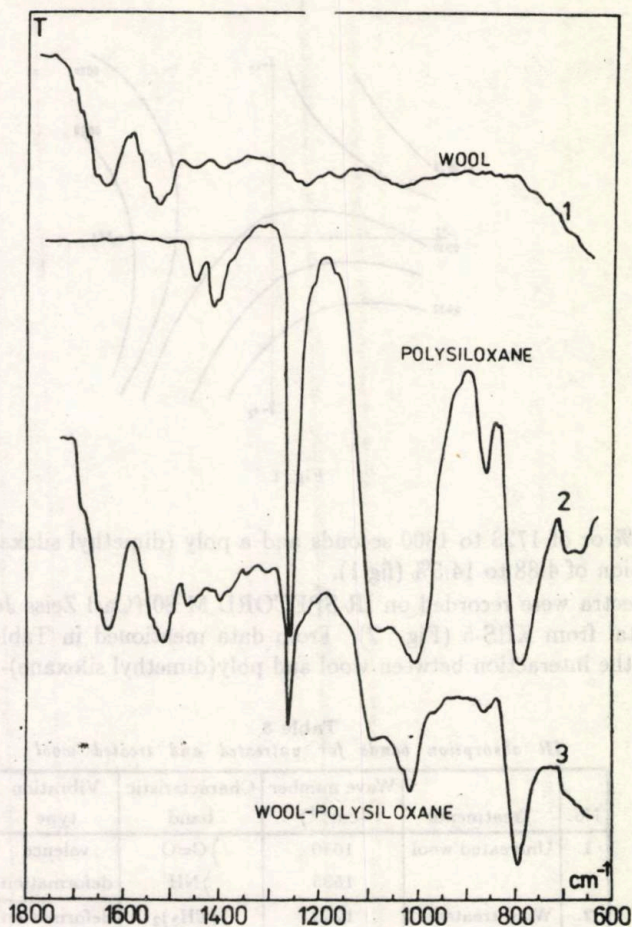


Fig. 2

high poly (dimethyl siloxane)- α, ω diols concentration or inversely.

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TRATAMENTE DE NEÎMPÂSLIRE A LÂNII

Partea a II-a: Tratamente cu poli (dimetil siloxani)- α, ω dioli

(Rezumat)

Poli (dimetil siloxani)- α, ω dioli au fost aplicați pe lână, în prezența unor reticulanți (triacetoxi metilsilan, di (α, α' -dimetil benzil) peroxid și benzoperoxid) în vederea obținerii rezistenței la contracție pentru materialele din lână.

DER EINFLUSS DER CHEMISCHEN VORBEHANDLUNGEN AUF DIE TINKTORIELLE KAPAZITÄT VON ZELULOSISCHEN FASERN

VON

AUGUSTIN MUREȘAN, RODICA MUREȘAN und ROMEN BUTNARU

1. Allgemeines. Bei den textil-chemischen Finish-Prozessen werden die Zellulose der Materialien vor dem Färben einigen Prozessen unterworfen, durch welche die natürlichen und technologischen Miteilerschmutzstoffen entfernt werden. Die genaue Ausführung dieser Prozesses ist für die Qualität der Färbung ausschlaggebend.

Zur Zeit werden zur Färbung von zellulosischen Materialien hauptsächlich direkte Farbstoffe verwendet, weil sie billiger und leichter verwendbar sind. Um mit diesen Farbstoffen eine bessere Färbqualität zu erzielen hat man in letzter Zeit die Kationisierung der Faser verwendet oder die Fixierung des Farbstoffes mit Hilfe von polifunktionale Reaktanten.

In dieser Arbeit wurde ein Studium über den Einfluß der Vorbehandlungen auf der tintoriellem Kapazität auf zellulosischen Fasern gemacht.

2. Experimenteller Teil. Verwendet wurde Baumwollfasern 100%, welche in einer alkalinen Lösung gekocht wurden. Die gekochten Fasern wurden in mehrere Teile geteilt, die jeweils nach klassischen Vorgängen merzerisiert, gebleicht (mit Wasserstoffperoxid, Natriumhypoclorit und Natriumchlorit) wurden. Ein anderer Teil wurde mit den kationischen Product Sanden R 8425 in Konzentration von 1 bis 5% nach den Verwendungsvorschriften [1] behandelt.

Diese vorbereiteten Probematerialien wurden mit zwei direkten Farbstoffen gefärbt – direktes Rot 4A (C.I. Direct red 2) und direktes Blau A (C.I. Direct blue 6) unter folgenden Bedingungen: 3% Farbstoff, Hydromodul 1:50, Temperatur 100°C, Zeitdauer 1-120 Minuten mit und ohne Elektrolyt (10%).

Das tintorielle Verhalten des vorbehandeltes Materials wurde durch Bestimmung der Affinität [2], der Diffusionskoeffizient [3], der Numer der Karboxylgruppen [4] und der Potential zeta [5] bestimmt. Die erhaltenen Daten wurden in Tabellen 1, 2 und 3 eingetragen. Dabei kann festgestellt werden, dass die Affinität der Fasern zum Farbstoff von der Art der Behandlung, von der Färbbedingungen und von der Struktur der verwendeten Farbstoffe abhängt.

3. Ergebnisse und Diskussionen. Verfolgt man die Einflüsse der Vorbe-

handlung, beobachtet man, daß die grosse Affinität des merzerisierten Material zu beiden Farbstoffen, sowohl mit oder ohne Elektrolyten. Die Merzerisierung hebt die Reaktivität des Fasern da diese anschwellen und die Diffusion des Farbstoffes in den kristallinen Zonen gesteigert wird. Mit diesen oxidanten Substanzen gebleichte Fasern weisen eine schwächere Affinität als die merzerisierten, was durch die Bildung von Karboxilischen Gruppen erklärt werden könnte, welche das negative elektrokinetische Potential des Faser hebt. Alle zum bleichen verwendeten Substanzen verhindern die Farbaaffinität der Fasern, aber zwischen den 3 Bleicharten werden keine besondere Unterschiede beobachtet, Konklusion die für die beiden Farbstoffe bleibt und auch für die Färbungen mit oder ohne Elektrolyt.

Tabelle 1
Ergebnisse für Farbstoff direktes Rot 4A

Nr. exp.	Art der Behandlung	$-\Delta\mu$ (Kj.mol ⁻¹)		$D \cdot 10^9$ (cm ² .s ⁻¹)	
		ohne Elektrolyten	mit Elektrolyten	ohne Elektrolyten	mit Elektrolyten
1.	gekocht alkalisch	2,016	4,478	2,87	2,83
2.	merzerisiert	2,061	6,314	4,63	4,60
3.	gebleicht mit H ₂ O ₂	1,90	5,451	3,15	2,91
4.	gebleicht mit NaOCl	1,766	5,532	2,56	2,59
5.	gebleicht mit NaClO ₂	1,304	5,328	2,46	2,57
6.	kationisiert mit:				
	1%	17,414	—	2,305	—
	Sandene R 8425 3%	17,448	—	2,49	—
	5%	17,522	—	2,99	—

Tabelle 2
Ergebnisse für der Farbstoff direktes Blau A.

Nr. exp.	Art der Behandlung	$-\Delta\mu$ (Kj.mol ⁻¹)		$D \cdot 10^9$ (cm ² .s ⁻¹)	
		ohne Elektrolyten	mit Elektrolyten	ohne Elektrolyten	mit Elektrolyten
1.	gekocht alkalisch	0,519	1,431	2,54	2,57
2.	merzerisiert	0,808	2,019	3,61	4,16
3.	gebleicht mit H ₂ O ₂	0,625	1,594	3,13	3,03
4.	gebleicht mit NaOCl	0,693	2,178	2,46	2,50
5.	gebleicht mit NaClO ₂	0,378	1,656	2,59	2,54
6.	kationisiert mit:				
	1%	18,25	—	2,28	—
	Sandene R 8425 3%	19,730	—	1,94	—
	5%	21,332	—	1,63	—

Das alkalisch gekochte Material, ohne andere Vorbehandlungen, weist die kleinste Affinität da nach dem Kochen noch nicht der ganze Schmutz entfernt wurde.

Untersucht man die Färbaffinität, stellt man ein 3-4 males Anwachsen der Electrolyten, je nach der Art der Vorbehandlung, fest.

Interessant ist die Veränderung der Affinität bei Verwendung kationischer Substanzen. Die mit 1% Kationische behandelte Substanz, nach Alkalikochen, führt zu einen Wachsen der Affinität, mit ungefähr ein mal beim direkten Rot 4A und ungefähr 35 mal beim direkten Blau A bei gleichen Färbebedingungen. Eine grössere Konzentration der Kationischen Substanz erhöht die Affinität für direktes Rot 4A nicht, aber erhöht leich die Affinität für Blau. Von der Struktur dieser beiden Stoffe wird der starke Einfluss der kationischen Substanz auf den Farbstoff Direktblau A erklärt, der 4 anionische Gruppen enthält, im vergleich zu dem Direktrot 4A der zwei solche Gruppen enthält.

Durch die verschiedene Struktur dieser zwei Farbstoffe kann man auch die erhaltenen Affinitäten bei den nicht behandelten Materialien erklären. Die Affinität ist grösser bei Direktrot 4A mit zwei anionische Gruppen, durch den kleineren elektrostatischen Gehalt im Vergleich zu der Affinität für Direkt Blau A mit 4 anionischen Gruppen in seine Struktur.

Die Affinität ist im Zusammenhang mit den Ergebnissen Erhaltung des Potentiales und der Inhalt der $-COOH$ Gruppen.

Tabelle 3
Der Potential und der Inhalt der $-COOH$ Gruppen.

Nr. exp.	Art der Behandlung	Der Potential (mV)	$-COOH$ Gruppen (%)
1.	gekocht alkalisch	-15,36	3,6
2.	merzerisiert	-17,15	4,5
3.	gebleicht mit H_2O_2	-20,5	5,4
4.	gebleicht mit $NaOCl$	-24,14	6,32
5.	gebleicht mit $NaClO_2$	-18,72	2,70
6.	kationisiert mit:		
	1%	-8,21	
	Sandene R 8425 3%	-2,47	
	5%	+3,83	

Bei der merzerisierten und alkalingekochten Proben ist der Potential kleiner, im Vergleich zu den verbleichten Proben, wo er grösser ist, und das beeinflusst die Affinität der Farbstoffen die abhängig von der Numer der $-COOH$ Gruppen aus der Struktur der Faser ist.

Als Folge kann man zeigen, dass die Vorbehandlungen der zelluloseischen Materiale ihre tinktorielle Kapazität beeinflussen.

Die Kationisierung erhöht die tinktorielle Affinität, aber der Einfluß dieser Behandlung ist im Zusammenhang auch mit der chemischen Struktur der verwendeten Farbstoffe.

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INFLUENȚA TRATAMENTELOR PRELIMINARE ASUPRA CAPACITĂȚII TINCTORIALE A FIBRELOR CELULOZICE

(Rezumat)

Sunt prezentate o serie de tratamente aplicate asupra fibrelor celulozice (fierbere alcalină, albire, cationizare) și modul cum acestea influențează capacitatea tinctorială. Pentru aceasta s-au efectuat vopsiri cu doi coloranți direcți cu structură chimică diferită. S-au determinat afinitatea tinctorială, coeficientul de difuzie, potențialul zeta și conținutul de grupări carboxilice.

Grupa	Tratament	Capacitatea tinctorială (%)	Coeficientul de difuzie (cm ² /s)	Potențialul zeta (mV)	Conținutul de grupări carboxilice (%)
1	Control	100	1,2	15	10
2	Albire	110	1,3	16	11
3	Fierbere alcalină	120	1,4	17	12
4	Cationizare	130	1,5	18	13
5	Albire + Cationizare	140	1,6	19	14
6	Fierbere alcalină + Cationizare	150	1,7	20	15

LA TEINTURE DES FIBRES DE POLYESTER À UN HYDROMODULE RÉDUIT

PAR

MARIN DINU et VALERIA NISTOR

1. Introduction. La teinture des fibres de polyester est influencée par une série de facteurs comme: l'hydromodule, la concentration de colorant dans le bain de teinture, le pH du bain de teinture, les auxiliaires chimiques, la température et la durée de teinture.

L'hydromodule indique le volume d'eau utilisé par l'unité de poids du tissu et varie en fonction de la forme de présentation de la matière à teindre (bourre, ruban, fils, tissus, tricotés) et de l'appareillage utilisé.

Les principaux problèmes de teinture dans les appareils avec circulation du bain sont la répartition uniforme de la dispersion dans la masse de fibre et l'absorption uniforme du bain par la fibre.

Dans le processus d'égalisation de la teinture interviennent: la composition du bain de teinture, les propriétés mécaniques et géométriques de la matière fibreuse (la densité d'enroulement pour les bobines) la construction de l'outillage, l'hydromodule du bain et la vitesse de circulation de bain.

Du point de vue de l'égalité des teintures, l'hydromodule plus grand est plus convenable, car la matière a sa disposition un grand volume de bain et on évite les non - égalités dues à la compacité de la matière. En même temps, pour de différents hydromodules, la même quantité de colorant utilisée pour une certaine intensité de teinture, sera plus diluée à des hydromodules grands (concentration en g/l) le colorant étant bien dispersé, ce qui favorise aussi l'égalisation.

Du point de vue économique, l'hydromodule grand est quand même désavantageux, car en ce cas, le taux de colorant inutilisé est plus grand tout comme les frais déterminés par la consommation d'eau et d'agent thermique.

Dans la pratique tinctoriale on a observé que le degré d'épuisement des colorants diminue à mesure que l'hydromodule augmente.

Le degré d'épuisement est le pourcentage de la quantité initiale de colorant passé sur la fibre dans les conditions données de teinture.

L'intensité de la teinture augmente avec la concentration en colorant du bain, mais l'augmentation de l'intensité est plus lente que celle de la concentration. Cela résulte de la figure 1 [1].

J. B o u l t o n et J. C r a n k [2] ont établi la dépendance de l'égalisation d'un facteur $v/k \cdot V$ où: v est la vitesse de circulation du bain, k - la constante de la vitesse d'interaction bain-fibre et V - la volume du bain de teinture. L'égalisation est favorisée par l'augmentation du facteur $v/k \cdot V$ en prouvant encore une fois

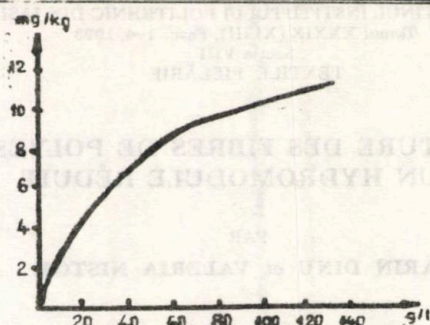


Fig. 1.— La dépendance de la quantité de colorant fixée sur la fibre en fonction de la concentration du colorant dans la solution.

qu'une grande vitesse de circulation contribue à la l'égalisation. En même temps on démontre que l'égalisation est bonne, même si le volume du bain V est petit.

D'ailleurs, les avantages d'un hydromodule réduit du bain de teinture résultent aussi du raisonnement suivant [3]: pour un hydromodule donné M et à débit constant de la pompe on considère l'interaction d'un volume quelconque de solution V avec une partie de la matière.

Si au régime donné par la pompe, la quantité de solution V vient en contact n fois avec la partie de matière prise en considération, au cas où le hydromodule diminue à $M/2$ avec la diminution appropriée du volume du bain, le nombre des utilisations du bain de teinture-matière textile augmentera à $2n$.

Parce que le processus d'égalisation est grandement basé sur les processus partiels de sorbtion et désorbtion, il en résulte que, dans le deuxième cas l'égalisation sera améliorée par l'augmentation des nombres d'interactions dans l'unité de temps.

L'utilisation des hydromodules réduits a, sans doute, un aspect économique intéressant parce qu'on réalise des économies importantes en eau, vapeur et dans une certaine mesure en colorants et produits auxiliaires.

Pour la réduction des hydromodules on peut aborder des moyens divers: le changement des conduits de circulation du bain et aussi le changement des bobines. La différence de pression entre l'écoulement du bain à travers la matière textile et les conduits doit être d'au moins 0,5 bar (pour assurer une circulation uniforme à travers toutes les bobines).

Au-dessous de cette valeur de la différence de pression on ne teint pas avec un hydromodule réduit.

La circulation du bain se fait dans un seul sens, de l'intérieur vers l'extérieur.

Généralement, la technologie de la teinture à hydromodule réduit est controversée. Par exemple, on conteste le fait que par l'hydromodule réduit on peut économiser du colorant, car la teinture se fait avec le même pourcentage par rapport à la masse de matière textile.

Conformément à la l'adsorption selon F r e u n d l i c h [4] les concentrations de colorant dans la fibre et dans la solution à l'équilibre ne dépendent pas de l'hydromodule du bain. Bien sûr que dans la teinture industrielle on doit prendre

en considération l'équilibre technologique qui est assez proche du vrai équilibre tinctorial. Mais, si en réduisant l'hydromodule, par exemple de $M = 1 : 10$ à $M = 1 : 5$ le bain résiduaire a dans les deux cas la même concentration de colorant en g/l, où si à un hydromodule réduit, le volume du bain, est diminué à la moitié, alors la quantité de colorant évacuée à l'égout est elle aussi réduite à la moitié.

Evidemment, la pollution par les bains résiduaires est réduite dans les mêmes proportions [1].

2. Partie expérimentale. Ayant en vue ce qu'on a présenté jusqu'ici, on a réalisé des teintures sur ruban de polyester à divers hydromodules (1:6; 1:9; 1:12; 1:20) conformément à la technologie classique pour constater l'influence de ceux-ci sur le degré d'épuisement, sur l'égénéralisation de la teinture et sur la structure des fibres.

Sur les éprouvettes teintées, on a accompli les analyses suivantes:

- l'égénéralisation de la teinture;
- le degré d'épuisement des colorants par des mesurages spectrophotométriques;
- solidités des teintures;
- analyses structurales des fibres;
- analyses physico-mécaniques.

Les analyses mentionnées ci-dessus ont été réalisées pour les fibres en polyester teintées à l'hydromodule habituel et à l'hydromodule réduit pour mettre en évidence les modifications de la structure des fibres et les caractéristiques physiques et physico-mécaniques comme suite à l'utilisation des hydromodules réduits.

De l'analyse des résultats obtenus sur les éprouvettes teintées résulte que les teintures sont égénéralisantes pour les hydromodules réduits également (1:6; 1:9); (les différences qui apparaissent parfois entre les éprouvettes teintées restent dans les limites des écarts technologiques et qui peuvent être dues à la variation de la structure des fibres et même aux caractéristiques de certains colorants).

Suite aux mesurages spectrophotométriques on a constaté une augmentation de l'épuisement en même temps qu'une diminution de l'hydromodule (figs. 2-4) qui n'affecte pas les solidités des teintures.

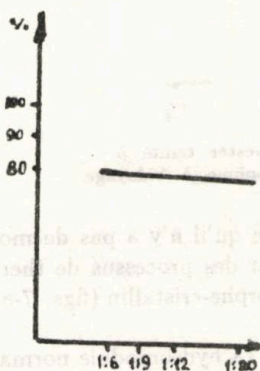


Fig. 2.- Polyspers gelb 3GS 2%.

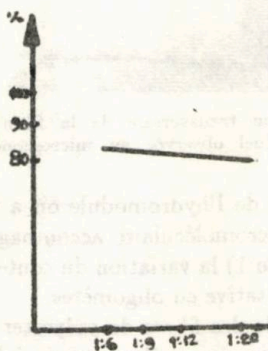


Fig. 3.- Polyspers rot FB 2%.

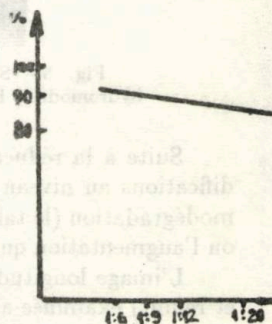


Fig. 4.- Foron brillant blau SG 2,8%.

En ce qui concerne la diffusion du colorant dans la section des fibres, tant dans le cas de l'hydromodule réduit que dans celui de l'hydromodule normal on a fait

des observations microscopiques sur la section transversale des fibres de polyester teintes dans des couleurs claires (figs. 5 et 6) et on a constaté une pénétration et une répartition uniforme du colorant à l'intérieur des fibres.

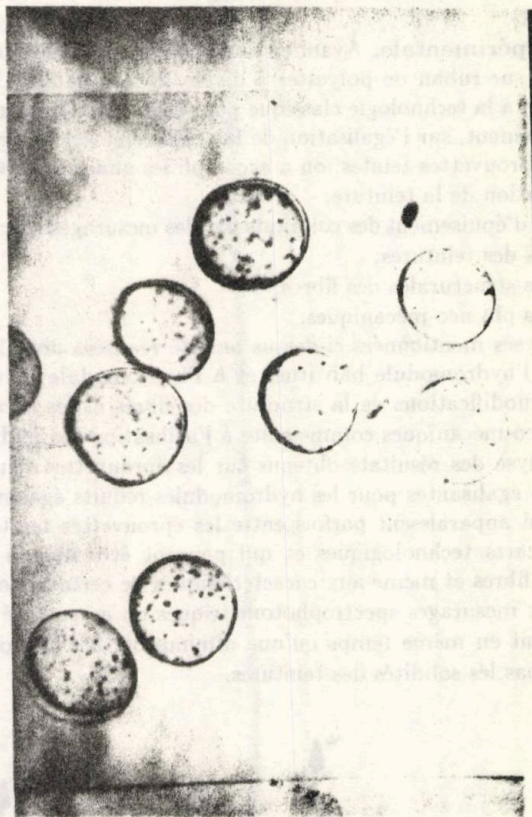


Fig. 5.- Section transversale de la fibre de polyester teinte à hydromodule habituel observée au microscope électronique à balayage.

Suite à la réduction de l'hydromodule on a constaté qu'il n'y a pas de modifications au niveau macromoléculaire accompagnées par des processus de thermodégradation (le tableau 1) la variation du contenu amorphe-cristallin (figs. 7-8) ou l'augmentation quantitative en oligomères.

L'image longitudinale des fibres de polyester teintes (à hydromodule normal et réduit) examinée au microscope électronique à balayage ne met pas en évidence des modifications essentielles du contenu en oligomères (figs. 9-10), chose confirmée aussi par les déterminations quantitatives en ultraviolet des oligomères sur des extraits en dichlormétane.

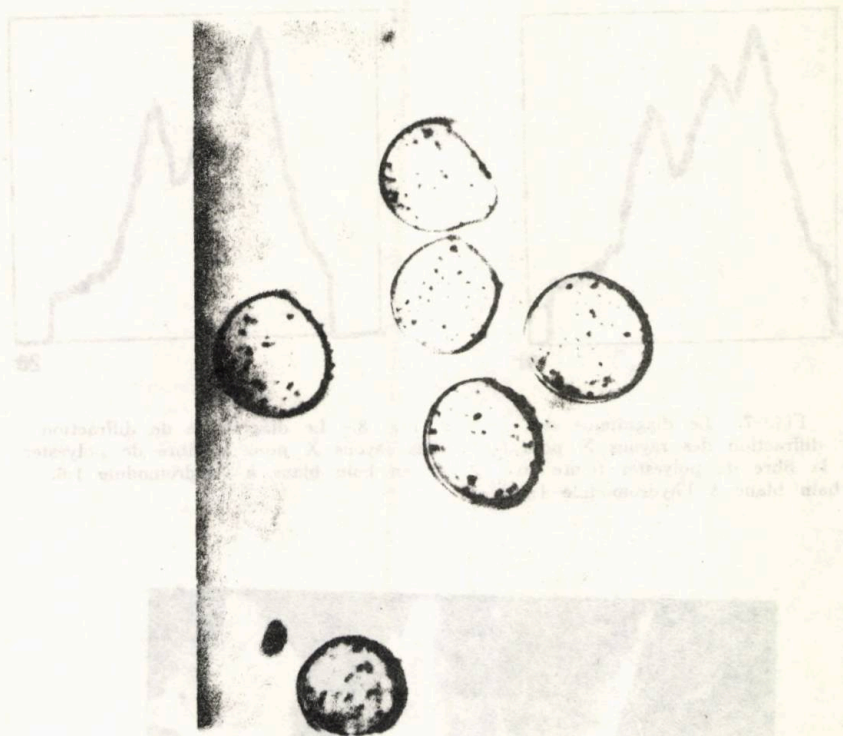


Fig. 6.- Section transversale de la fibre de polyester teinte à hydromodule réduit observée au microscope électronique à balayage.

Tableau 1

La masse moléculaire moyenne des fibres de polyester après la teinture à divers hydromodules.

Hydromodule	Viscosité intrinsèque	Masse moléculaire moyenne
1:6	610	21 000
1:9	613	21 800
1:12	614	22 000
1:20	625	22 500

Les caractéristiques physico-mécaniques des fibres de polyester ne sont pas influencées par la réduction de l'hydromodule (tableau 2).

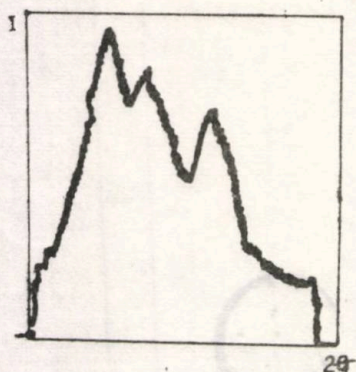


Fig. 7.- Le diagramme de diffraction des rayons X pour la fibre de polyester teinte en bain blanc à l'hydromodule 1:20.

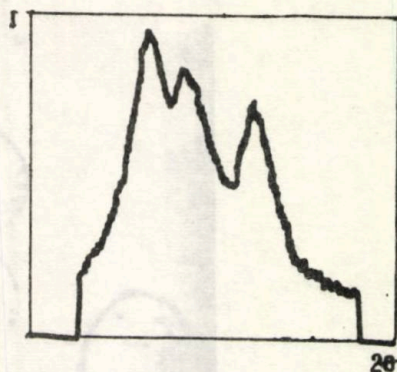


Fig. 8.- Le diagramme de diffraction des rayons X pour la fibre de polyester en bain blanc à l'hydromodule 1:6.

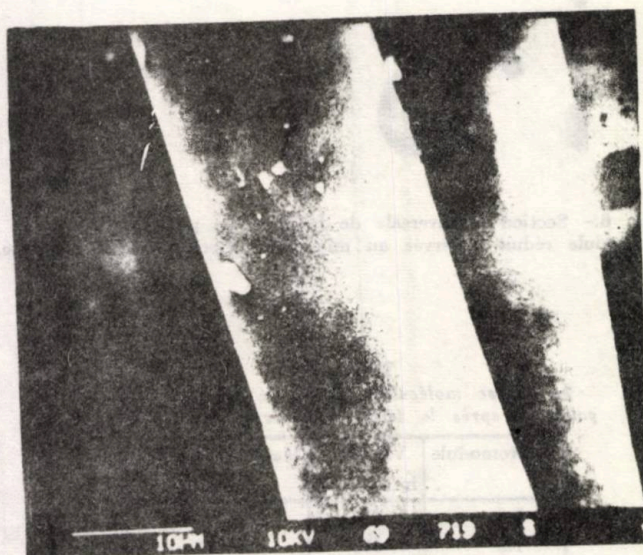


Fig. 9.- L'aspect longitudinal de la fibre de polyester teinte en bain blanc à hydromodule habituel observé au microscope électrique à balayage.

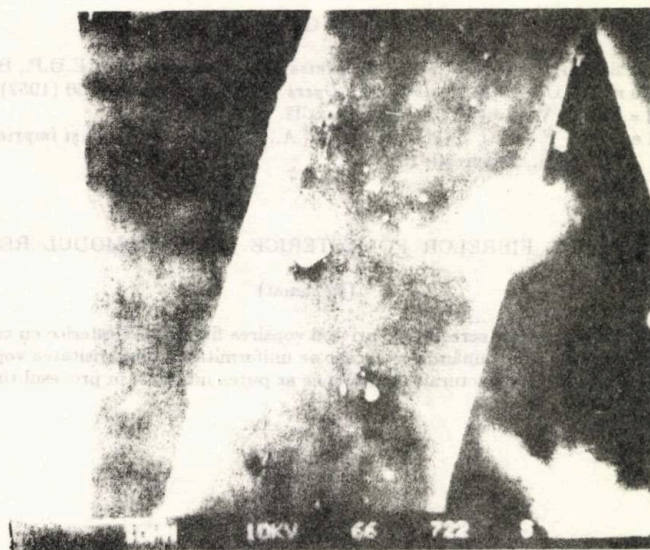


Fig. 10.- L'aspect longitudinal de la fibre de polyester teinte en bain blanc à hydromodule réduit observé au microscope électrique à balayage.

Tableau 2

Caractéristiques physico-mécaniques des fibres de polyester sous forme de ruban ayant une finesse de 4-dtex teintes à différents hydromodules.

Caractéristiques physico-mécaniques	La valeur de l'hydromodule			
	1:20	1:12	1:9	1:6
Ténacité, (cN/dtex)	3,01	3,00	3,01	3,02
Allongement, (%)	37	36,5	36,7	36,5

3. Conclusions. La teinture des rubans de polyester à hydromodule réduit quoiqu'elle demande plus d'attention de la part du teinturier, conduit à la réalisation d'une teinture égalisante avec des économies de colorants, d'agent thermique et d'eau.

Le procédé n'affecte pas la structure et les caractéristiques physico-mécaniques des fibres de polyester.

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Société Commerciale
„Argeșana“, Pitești
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MIGRATION OF THE DYESTUFFS DURING THERMOSOL DYEING PROCESS

BY

VALERIA NISTOR, LILIANA IRIMIA and CRIȘAN POPESCU

1. Introduction. Thermosol dyeing process of the polyester fabrics has the following steps [1]:

- padding of the fabric with a dispersion of dyestuffs and mangling to a certain pick-up degree;
- pre-drying and drying of the fabric;
- thermosoling;
- aftertreatment (dyeing of other fibres from the blend, for example).

During pre-drying stage the dyestuff particles are directed mainly to the surface of the fabric, where the vaporisation process takes place. This is, in fact, the migration process, which is a quite complex phenomenon influenced by many parameters whose effects are discovered only at the end of the dyeing.

In order to elucidate the reasons of the migration phenomenon, H. G e r b e r [2] proposed a theoretical model to give account of the dyestuff particles migration by taking into consideration the evaporation rate, specific features of the textile support (weight, length and capillary rayon) and the parameters of the padding bath.

H. L e h m a n [3] proposed a practical model which describes well the pad-dry technology. This model is presented in Figure 1.

According to this model the migration process may be divided into four categories, i.e.:

A. horizontal migration, determined by the migration of the dyestuff particles in an horizontal plane. As a result the dyeing looks uneven and since the particles migrate from more twisted yarns towards those less twisted, stripes may also occur. Some other effects due to the horizontal migration are, also: rain-like aspect on the high density light fabrics, and broken points on the very light fabrics made from low twisted yarns.

B. selective horizontal migration of each dyestuffs blend component, which produces a bicolour effect due to the discroism of the dyestuffs.

C. vertical migration, due to a different heating of the two faces of the fabric, which may lead to shade differences between face-back, side-middle, etc.

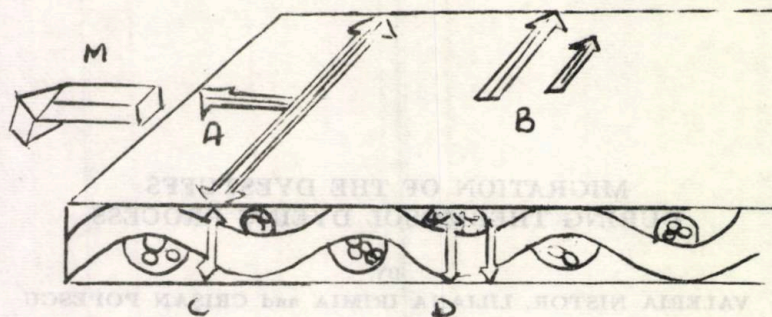


Fig. 1.- Graphical plot of the various migration types during the pad-dry dyeing technology.

D. selective vertical migration which produces the shade differences between different parts of the fabric.

2. Factors which affect migration. The laboratory control of the migration behaviour is done by one of the four tests well-described in the literature, i.e.: sandwich test [4]; watch glass test [5]; glass plate test [5]; plate test [5].

Any of these tests may be used in order to put into evidence the influence of various factors on to the migration process.

The factors which affect the migration process may be splitted into [6]:

- i) Dyestuff influence;
- ii) squeezing degree of the textile fabric;
- iii) textile fabric influence;
- iv) drying conditions;
- v) influence of the dyebath auxiliaries (migration inhibitors).

In the following each of these factors will be discussed according to our results.

i) The influence of the dyestuffs

The thermosol dyeing of polyester/celulosic blend fabrics requires the use either in mixture or separately, of insoluble (disperse, vat dyes) and soluble (direct, reactive, reduced sulphur dyes) dyestuffs.

The soluble and insoluble dyestuffs differ strongly from point of view of migration behaviour. For example the insoluble dyestuffs migrate strongly because their particles are well dispersed into bath and have the possibility to move freely. During the heating of the textile support the particules of dyestuffs are, consequently, easily oriented towards the surface of the fabric.

The soluble dyestuffs migrate significantly less than those insoluble, as they have a better substantivity to fibre. Among the various commercial forms of these dyestuffs, those which behave best are the liquid ones.

Actually the size of the dyestuff particle gives the dyestuff behaviour, and we have noticed that the dyestuffs which have small particles migrate easier than those with bigger particles, when all the other conditions are kept constant. For

this reason each dyestuff, according to its particle size, may be characterized by a migration figure. Higher the figure is, higher is the migration behaviour of the dyestuff. The method to determine the figure of migration is not yet standardized, but each laboratory may build up its own scale. For our purposes we considered, for example, some migration figures for four disperse dyestuffs: C.I. Disperse Blue 79 = 2; C.I. Disperse Blue 19 = 3; C.I. Disperse Yellow 42 = 4 and C.I. Disperse Red 54:1 = 5.

ii) The influence of the squeezing degree

According to our results the migration process occurs when the dyestuff is led by the liquid flow through the capilars towards the surface of the fabric. The dyestuff transport process stopped when the so-called migration threshold is reached. The end-point of the migration process depends on the textile support itself.

Since the migration process is assisted by the unbonded water, the hydrophile fibres have a reduced migration whereas the hydrophobe ones exhibit a strong migration of the dyestuffs. Consequently the values of the migration threshold should depend both on the fibre structure and on the size of the dyestuff particle.

According to some authors the migration threshold as related to the retained water into capilars should be: 40% for viscose, at 85-100% physically retained water; 21% for cotton, at 45% retained water; 20-35% for polyester/cotton 67/33.

Actually during the padding, migration process is inverse related to the squeezing degree, a decrease of this degree from 70% to 40% leading to a significant decrease of the migration.

iii) The influence of the drying conditions

Many papers have pointed out that the pre-drying process is the cause of most of the migration faults during thermosol dyeing. As far as the capilars are filled with water the dyestuff particles may migrate. That means that the pre-drying process is of a major importance. A high vaporisation rate will lead to a low migration rate, if the heating is performed by radiation (IR radiation). At the same time the high heating rate produced serious differences between various area of the material, which may lead to some faults.

When the pre-drying is performed by convection, the temperature of the heating agent and its circulation speed are influencing the migration. Higher is the circulation speed and temperature of the agent, higher the migration is. It results, thus, that a zero circulation of the air draft will lead to a minimum migration effect. We may recommend, for the units without IR device, that the pre-drying step, within the first room of the unit, to be performed at the lowest temperature (usually 80 to 100°C) and without air circulation.

iv) The influence of the textile support

The influence of the textile support on the migration process is quite a complex phenomenon. The first results of the migration process analysis pointed out that the migration process increases when the specific surface of the fabric diminishes. Since the specific surface of the fabric is related to the fibre diameter we shall have a relationship between the migration rate and the fineness of the fibres.

Moreover, as it was already showed, the hydrophobic fibres allow a higher migration effect to occur, as compared to the hydrophilic one. It may be concluded thus that more synthetic component a fabric has, and coarser the fibres are, higher the migration rate is.

At the same time one has to take into account the parameters of the fabric such as: weight, density, sett, yarn count. The unevenness of the yarn count, for example, will lead to differential drying, and, consequently to the development of an horizontal migration together with the vertical one. As a result stripes and frosted look of the fabric will occur.

Practically it was also noticed that wider the fabric is, higher the migration rate is, since the evenness of the heating on the surface of the fabric is more difficult to be reached.

v) The influence of dyebath auxiliaries (migration inhibitors)

Since the beginning of the thermosol process, some special auxiliaries called migration inhibitors have been developed.

These chemicals are either natural polymers such as alginates, or synthetical polymers such as acrylic polymers.

The mechanism these chemicals act is by coagulating the dyestuff particles, which leads to a reducing of the moving tendency within the capilars network of the textile fabric.

The way these chemicals act is still unknown. It is supposed that the polymers are adsorbed on the surface of the dyestuff particle and the so-appeared ensemble cannot move anymore because of the geometrical restrictions.

Each migration inhibitor has a critical concentration for which the yield of the dyestuff fixation is not affected. The correct determination of this critical concentration requires several trials to be made. Practically the end-result of the dyeing is observed by comparing the middle and the sides of the fabric, side to side and head to end. In order to reduce as much as possible the migration phenomenon, beside taking into account all the factors already described which affect the effect, it has also to be used migration inhibitors.

A new product of ICPAO Medias, Romania, named Romacril SAVR, which is a copolymer based on acrylic acid and acrylamide, has been used for this purpose and it has been compared with some known brands, i.e. Solidokol N, Primasol AMK and Medacril SAV.

The efficiency of Romacril SAVR as migration inhibitor have been investigated by dyeing with, and without the inhibitor and subsequently subjected to the watch glass test [5].

The dyeing process used a mixture of disperse/vat dyestuffs (Cottestren Violet 3B), a vat dyestuff (Indanthrene Grey HBR) and a disperse dyestuff (Disperse Blue 2R) to perform and the applying technologies have been accordingly, i.e.:

- for dyestuffs mixture: padding through the bath with

20 g/l Cottestren Violet 3B,

10, 20 or 40 g/l inhibitor,

acetic acid for pH=6...6.5,

temperature of 30-40°C,

pick-up degree of 60%.

After the padding have been done, a drying, heat setting for 6 seconds at 210°C, developing of vat dyestuff, drying, steaming, washing, oxidizing with 1 g/l natrium dicromate for 20 mins at 60°C, washing again have followed. The fabric used for this dyeing process has been a 67/33 polyester/cotton blend.

All the four inhibitors named above have been used for comparing their results.

- for vat dyestuff: padding of a cotton fabric 100% through a bath with

50 g/l Indanthren Grey HBR,

0, 10 and 20 g/l inhibitor,

pick-up degree of 60%.

After the padding, the fabric followed the next steps: reduction of the vat dyestuff by padding through a bath with 85 ml/l NaOH 38°Bé and 72 g/l natrium dithionite, drying, steaming for 1 min at 102-105°C, oxidation and soaping.

Again all the four inhibitors have been used for allowing the comparison of their results.

- for disperse dyestuff: padding of a polyester fabric through a bath with

10 g/l Disperse Blue 2R,

10, and 20 g/l inhibitor, and

a double concentration of Medacril SAV.

Afterwards, the fabric has been dried, heat setted for 1 min at 120°C, washed and reducing cleaned with a solution of 4 ml/l NaOH 38°Bé and 2 g/l natrium dithionite for 20 min at 70°C.

According to our results, Romacril SAVR stops the migration during the pre-drying process. It has also a good influence on the look of the fabric surface by assisting the levelling of the dyeing and, consequently, it offers the opportunity to use the dyestuff in an optimum amount. The results obtained for the four inhibitors led us to the conclusion that the next concentrations have to be used in order to achieve similar effects:

Romacril SAVR	20 g/l
Medacril SAV	40 g/l
Primasol AMK (BASF)	20 g/l
Solidokol N (Hoechst)	20 g/l.

If one takes into account that the dry substance of the four inhibitors are: Romacril SAVR - 20%, Medacril SAV - 10%, Primasol AMK - 20% and Solidokol N - 20% we may conclude that the influence on the migration process is brought by the dried substance amount of the inhibitor and not by its chemical structure.

For our own purposes the other migration tests have been also performed and the same results have been obtained.

We have to underline again that the inhibitors do not behave identically with all the dyestuffs. In fact, as it was already showed, the migration effect depends on the dyestuff particle size too and consequently beside the inhibitor action one has to take into account the influence of all the other parameters.

The laboratory obtained results have been tested in an industrial trial, and similar effects have been noticed.

3. Conclusions. The present paper discusses the general principles of the migration phenomenon during thermosol dyeing process, and the principles have been applied to the description of the effect of some inhibitors, among which Romacril SAVR was tested in order to be introduced in industry.

The laboratory obtained data pointed out that Romacril SAVR has a similar effect as Primasol AMK and Solidokol N.

The algorithm used to compare various products for the inhibitor action during the thermosol dyeing may be followed for any other products.

The laboratory obtained results have been confirmed by industrial trials.

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MIGRAREA COLORANȚILOR ÎN PROCESUL DE VOPSIRE TERMOSOL

(Rezumat)

Se prezintă principiile generale ale fenomenului de migrare a coloranților în procesul de vopsire termosol.

Aceste principii sunt aplicate în analize unui nou produs Medacril SAVR comparativ cu inhibitorii de migrare existenți pe piață.

L'AMÉLIORATION DE LA VALEUR DE LA TENSION DANS LES FILS DE LA CHAÎNE POUR LES TISSUS DE TYPE LAINE PEIGNÉE

PAR

CECILIA DACIA DUȚESCU, MARIN DINU et VALERIA NISTOR

1. Introduction. Pendant l'étape technologique d'ourdissage suite au déroulement des fils des bobines du râtelier dans le ballon de déroulement à la zone du dispositif de freinage apparaissent des tensions tout comme au passage du fil sur les organes conducteurs.

Certaines valeurs de la tension sont obtenues à l'aide des dispositifs de freinage, en changeant la direction du fil en appliquant aux fils des charges normales et aussi leur association tenant compte du réglage de chaque dispositif de freinage.

Dans la littérature de spécialité on nous présente des relations de calcul de la valeur de la tension du fil à sa sortie du dispositif de freinage [1].

On a constaté l'augmentation de la tension par rapport à la vitesse d'ourdissage et aux positions de réglage et la diminution de la tension en même temps que l'augmentation de la distance entre la bobine et le dispositif de freinage [1].

La valeur de la tension dans le fil est aussi influencée par les forces d'inertie des organes en mouvement, des fils dans le châssis et par forces de frottement, données par les dispositifs de freinage qui conditionnent la densité d'enroulement [2].

La tension des fils est un phénomène physique non-souhaité et inévitable, mais nécessaire, c'est pourquoi sa valeur dans tous les processus technologique d'usinage tant pendant la préparation que pendant le tissage elle doit avoir une valeur minimum nécessaire, conforme à l'opération technologique respective, aux caractéristiques et à la finesse des fils [3][4].

Pour que le processus technologique se déroule normalement sans défauts et avec un grand rendement, il faut que dans la section d'ourdissage s'accomplisse un contrôle technique permanent interphasique le contrôle se rapporte:

- à la position des fuseaux du cadre de l'ourdisseur qui doit être bien fixé pour ne pas osciller, et les ressorts des fuseaux ne doivent pas être fatigués ou rompus;
- à l'état des freins en porcelaine: ceux-ci doivent être nettoyés en permanence, ils ne doivent pas avoir des rainures et des fissures, ils doivent être bien fixés, ne pas avoir d'agglomérations d'effilochures, tout cela pouvant mener à l'apparition des fils tensionnés;

– les rondelles de freinage doivent adhérer à tout la surface du support en porcelaine en tourner pendant l'ourdissage et le nombre de rondelles de freinage et leur poids doivent être les mêmes tous les bobines pour que tous les fils aient la même tension;

– la vérification permanente des conducteurs de fil en porcelaine qui doivent être fixés sur le râtelier et exempts de jeu, aspérités ou fissures, effilochures, graisses, etc.;

– l'état du peigne extensible dont les dents doivent être complètes et en bon état, sans rainures et écorchures, sinon les effilochures pourraient s'amasser et détériorer le fil.

Conformément à la littérature de spécialité la tension optimale à l'ourdissage T (gf) pour les fils type laine peignée est donnée par le relation suivante:

$$T = (0,4 - 0,6)T_b$$

où T_b = la tension du fil pendant le bobinage (gf/fil),

$$T_b = (0,08 - 0,12)R.$$

Aux fils torsionnés $T_b = 0,012R$ où R = la charge à la rupture du fil (gf).

Quand la tension nécessaire se réalise avec des rondelles de freinage, leur poids est choisi en fonction de la finesse du fil.

La littérature recommande un poids de 7 gf pour fils peigné à une vitesse d'ourdissage de plus de 400 m/min et pour les mêmes fils à une vitesse d'ourdissage sous 400 m/min le poids des rondelles sera de 9 gf [2].

2. Partie expérimentale. Etant donné que les frais pour le repassage représentent un poids important du montant des frais de production des tissus et que dans l'opération de rapassage on incult la rectification des fils tensionnés on a établi les valeurs optimales des tensions dans les fils de chaîne pour les tissus étudiés à l'aide des relations énoncées ci-dessus, comme il suit:

Pour les chaîne, dans le cas des tissus contenant 70 PES/30 laine (article 253-502-7) où les fils ont la charge à la rupture $Rr=520$ gf, et $T_b = 0,12R$ il résulte: $T_b = 0,12 \times 520 = 62,4$ gf/fil et $T = 0,6 \times T_b = 0,6 \times 62,4 = 37,44$ gf/fil.

Conformément à la méthodologie de calcul on adopte la valeur optimale pour $T = 40$ gf/fil [2].

Donc, la tension dans le fil à l'ourdissage doit être réglée à la valeur de 40 gf/fil, sous contrôle avec un tensiometre, en utilisant des rondelles de 9 gf.

Dans le cas des tissus avec un contenu fibreux 60 polyester 40 fibranne (article 294-16-6) dont les fils ont la charge à la rupture $R = 480$ gf et $T_b = 0,12R$.

Il en résulte que:

$$T_b = 0,12 \times 480 = 57,6 \text{ gf/fil};$$

$$T = 0,6 \times T_b = 0,6 \times 57,6 = 35,4 \text{ gf/fil}.$$

On adopte la valeur de la tension optimale $T = 40$ gf/fil [2].

Dans les deux cas présentés ci-dessus on a adopté la tension de 40 gf/fil en tenant compte, des divisions de l'échelle de l'appareil et des oscillations de l'aiguille indicatrice.

Donc la tension dans les fils de la chaîne doit être réglée aux valeurs optimales résultées à la suite du calcul sous le contrôle de tensiomètre en utilisant les rondelles appropriées.

En fonction des mesurages effectués, on fixe et on dispose sous le contrôle de la tension les rondelles de tension au cadre d'ourdissage, on règle aussi la position des conducteurs de fil d'une telle manière que la tension dans les fils soit à peu près égale à celle établie par le calcul ci-dessus.

Ces chaînes ont été montées sur les machines à tisser ("IMATEX") en suivant leur comportement dans le processus du tissage et aussi la fréquence des fils tensionnés sur les tissus écrus.

Les résultats de cette étude peuvent être appliqués de la manière suivante:

- en employant le calcul de la méthodologie présentée ci-dessus on établit la tension optimale dans fils pour n'importe quel type de tissus et article fonction de la composition des fibres, de la finesse, du type de l'ourdisseur et des vitesses de travail des machines [2];

- on établit et on fixe les rondelles aux cadres à ourdir sous le contrôle de la tension dans le fil à l'aide du tensiomètre aux valeurs établies pour chaque article;

- une fois la tension dans le fil établie, le poids et le nombre des rondelles restent valables pour toutes les chaînes de la catégorie respective qu'on usine sur le même type de machine et dans les mêmes conditions technologiques en valorisant périodiquement les paramètres établis.

Pour les chaînes où on a fait le réglage de la tension dans le fil, selon la méthodologie présentée ci-dessus on a réduit le nombre des fils tensionnés dans les tissus obtenus de 5,59 à 0,28%.

3. Conclusions. Par l'amélioration de la valeur de la tension des fils de chaîne pour les tissus étudiés on a réduit considérablement la fréquence des fils tensionnés ce qui a eu comme conséquence la réduction des frais pour le repassage et du temps de stationnement de la production non-finie avec la durée afférente de l'opération de repassage.

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OPTIMIZAREA VALORII TENSIUNII LA FIRELE DE URZEALĂ PENTRU ȚESĂTURILE DE TIP LÂNĂ PIEPTĂNATĂ

(Rezumat)

Se prezintă un procedeu de reglare a valorii tensiunii în firele de urzeală pentru țesăturile tip lână pieptănată.

En fonction des mesures effectuées, on fixe et on dispose sous le contrôle de la tension les rondelles de tension en cadre d'ourissage, on règle aussi la position des conducteurs de fil d'une telle manière que la tension dans les fils soit à peu près égale à celle établie par le calcul ci-dessous.

Ces chaînes ont été montées sur les machines à tisser ("IMATEX") en vue de leur comportement dans le processus du tissage et aussi la fréquence des tensions sur les fibres seules.

Les résultats de cette étude peuvent être appliqués de la manière suivante: — en employant le calcul de la méthodologie présentée ci-dessus on établit la tension optimale dans les fils pour le type de tissage et établit la position de la composition des fibres, de la finesse, du type de l'ourissage et des vitesses de travail des machines [2].

— on établit et on fixe les rondelles aux cadres à ourdis sous le contrôle de la tension dans le fil à l'aide du tenseur aux valeurs établies pour chaque article;

— une fois la tension dans le fil établie, le poids et le nombre des rondelles restent variables pour toutes les chaînes de la catégorie respective qu'on utilise sur le même type de machine et dans les mêmes conditions technologiques en variant périodiquement les paramètres établis.

Pour les chaînes où on a fait le réglage de la tension dans le fil, selon la méthodologie présentée ci-dessus on a réduit le nombre des fils tendus dans les tires obtenus de 0,35 à 0,38%.

3. Conclusions. Par l'application de la valeur de la tension des fils de chaînes pour les tires étudiées on a réduit considérablement la fréquence des fils tendus ce qui a eu comme conséquence la réduction des frais pour le tissage et du temps de fonctionnement de la production non-fibre avec la durée effective de l'opération de tissage.

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MANAGING THE TEXTILE COMPANIES IN THE ROMANIAN CHANGING ECONOMY

BY

COSTACHE RUSU and SILVIA BALLA

Change is the most constant and most important dimension of the contemporary society. There is a permanent battle between change and stability, and there is no change without endeavour, confidence, efforts and, sometimes, pain. The new is not realized in the rhythm and with the quality needed without making first the changes to clear the way, so that the new may be developed. Some of obstacles for changes are: non-existent proper legislative environment, weak correspondence between authority and responsibility, type of ownership, insufficient motivation, the quality of some managers who don't know, are not able to, or don't want to manage efficiently.

The most difficult problem for a company to succeed, in the economic conditions of Romania today, is its own change. The companies policies of changing are a complex process, if we take into account that the environment is changing constantly. The change of the companies should mean first the change of people, of managers, and second the change of methods and techniques, processes, technology and informational systems. The work climate, mentalities, habits, styles and methods of management, education of people are essential factors in realizing the efficiency changes.

The changes must not be made only for the sake of changing, although it has happened in the last few years in Romania. Any change must have its mission of improving the technical and economic performances of the company, by satisfying the market in the best way.

Managers from all over the world are dealing with changes, but how many of them are ready to face it, especially in the conditions in Romania, where the changes are dramatic and accompanied by a high level of uncertainty and there are directly reflecting themselves in such factors as: inflation rate, capital price, raw materials price, the level of wages, etc.

Considering all these, change presently becomes the essential factor of developing romanian companies. Change, or the new, must not be imposed, it must be promoted. The change of the companies is accomplished in the very moment in which the factors which are generating it are more stronger than those of preserving

the existent situation. The manager should be the generating factor of changing.

Knowing the possibilities of the systems which they manage, the managers will be able to transform it more successfully from stage A, which existed until 1989, to stage C, a future stage opened to change. We are estimating reaching stage C after the year 2000. Until we say we are in a transition stage B. In order to point to the management evolution of a production system, during the stage B, we considered some aspects of the principal technical and economic issues: the environment, the resources, the techniques and technology, human resources and others.

Until 1989 the social and economic environment was almost unknown for the textile enterprises. After that date, due to the political and economic changes which took place, begins to exist the need for knowing the environment.

The future of the companies and of production systems is closely related to a very good understanding and knowledge of the changes in the environment. When we say environment we mean: the economic environment; type of ownership; the social, technological, ecological, historic, religious, political, cultural, educational, legislative environment, and so on. Of course, what should concerne the company are those changes which, sooner or later, will affect its activity.

The best way of understanding the market economy is having contacts with it. Without a practical experience it is very difficult to understand the market economy and competition. That's why the contacts with western companies are very useful.

For developing the private companies the government must provide the environment and network needed. But everyone must understand that the government's support has also its limits. No government can overcome sectionalism (insufficient integration of organizational activities; e.g., research and marketing are done separately).

In the past company's objectives, missions, and strategies, were not a problem of the company because there were settled by the ministry. Now, in our changing economy, these items have changed their sense and content. That's why some textile companies are not able to or don't want to define their objectives. In the future, each company will settle its own objectives, missions and strategies.

Because in the past the plan was fixed by the ministry, some textile companies are denying the plan's role, for they don't know, are not able to, or don't want to make a plan. In the future, each company will settle its own plan, which will be flexible, correlating the objectives with the existent resources.

The organizational structure before 1989 was rigid and fixed by the ministry. Due to the evolution of our society in the last years, specific offices have been created and developed in the organizational structure of management which correlate with the production structure. For the future, we stipulate that the organizational structure will be flexible, settled by each company.

The resources have been, are now and will be limited. But in the past they were entirely distributed by the state. At present, because the state is and will be, for some time, the main owner, resources are partially distributed by the state. In the future, the resources will be distributed according to the market supply and

demand.

The resources are no less important than the objectives, because they have changed and still are changing. The diminishing of economic relations with other Eastern Europe countries, the economic recession, and competitive imports have led to a decrease of local resources and an increase of the imported resources. They are an important factor in managing the changing process, a process which should be correlate to the change's objectives with both resources and technologies used for accomplishing them.

A very important problem had been, and still is, the optimum use of the resources. In the past, for the planned resources it was compulsory to be consumed before getting any new ones. In the present, new mechanisms and organisms have been created in order to realize a better consumption or use of resources. In the future, the company's activity will be closely related to the optimum use of the resources.

Until 1989, the technical and technological level of the romanian textile enterprises was low, due to a lack of investments in some branches of our national economy. In the last years, many investments have started through privatization and joint ventures. We stipulate that in the future the technical level in Romania will be closer to the western one. Nowadays the private companies, not governments, own most technologies. Without adequate compensation, no one can get access to the privately owned technologies.

In the present, in our country, the old techniques and technologies used are influencing materials and power consumption, costs and quality of products. We must make strong investments in technology to be able to turn into good account the economic potential of Romania.

Romanian textile companies, in order to be able to make changes, must use a fundamental feature of a company: autonomy. Briefly, autonomy is a feature of a system to be self-regulated. In present, many people don't believe that autonomy really exists. Either they are afraid to use it, or they are not motivated enough. Companies autonomy must be respected. The price being settled in the market, each company must have its own profit margin, which is difficult to be accepted yet by the people.

Because before 1989 autonomy didn't exist, there are some negative consequences now, when autonomy exists, but it is not used. Companies need courage and must make real efforts to use real autonomy.

Closely related to autonomy is adaptability. Textile companies had in the past a maximum capacity of adaptation, which was not applied in our market. In present, we may observe the adaptability mainly in the small business. In the future, the company's adaptability will be at the same level with its autonomy.

In the past, there was not competition in our market, because all information was held by the state. At present, some people don't realize that the relations between companies must change, that companies are in a permanent competition. In the future, the competition will be stronger, both on the internal and external market. Great efforts will be needed to obtain information concerning the market,

products, competitors, etc.

In the past, the models, principles, methods, proceedings, techniques, and modern instruments of management were partial known, but they were not applied due to the types of ownership which existed. Now, in fact, we are testing the models, proceedings techniques, and modern instruments of management which may be applied to the romanian changing economy. In the future, we will widely apply them.

A company's activity is always reflecting the quality of its management. Until 1989, the manager was designed by the Party, on the basis of relationships with the Party, identifying oneself with its job, and some managers were staying for life in the same job. The official authority didn't corresponded with the authentic one. The style was tyrannical, attacking and bureaucratic. Nowadays the manager of the company is more of a leader and less manager. Instead of representing the owner, he is designed at the union's pressure, and even changed by them. There is fear of people and fear of delegating authority. Prevailling is the official authority and not the authentic one. Some managers begin to be aware of the necessity of initiative and group communication, but the style is hesitating and bureaucratic. In the future, the manager will be the head and engine of the organization, one who will think, foresee, organize, handle any situation. There will exist a very good correspondence between the official authority and the authentic one. He will be able to assume the consequences and responsibilities of the solutions adopted and he will easily pass from idea to fact, that is he will be a man of action.

The company's management had been and still is determined by the style of ownership existing within the company. The management before 1989 reflected the state ownership. Now, that privatisation started the state is the principal owner. We stipulate that in the future the private capital will have the major weight.

Human resources were, before 1989, insufficiently trained for the market economy and negatively motivated. Now, not everyone realizes the importance of the labor force quality. In the future, the selection, training, and promotion of employees will be done only according to their competence and professional knowledge.

Because of the lack of managerial culture, the selection, training, and promotion of managers must be done very carefully. In these years of transition through the market economy, the manager must influence the attitude towards work and mentalities of his employees. He must realize that the most valuable asset of a company is the thinking and training of its employees. It's them who are building the performances and the images of company.

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CONDUCEREA ÎNTREPRINDERILOR TEXTILE DIN
ECONOMIA ROMÂNEASCĂ ÎN PERIOADA DE TRANZIȚIE

(Rezumat)

Schimbarea este dimensiunea cea mai constantă și mai decisivă a societății contemporane. Există o permanentă luptă între schimbare și stabilitate, iar schimbarea nu se realizează fără strădanie, încredere, efort și, câteodată, durere. Noul nu se realizează în ritmul și de calitate necesare fără a face mai întâi schimbările care să elibereze drumul, astfel încât noul să se poată dezvolta. Câteva din obstacolele care stau în calea schimbărilor sunt: inexistența cadrului legislativ adecvat; slaba corespondență între autoritate și responsabilitate; tipul de proprietate; motivarea insuficientă; calitatea unor manageri care nu știu, nu pot sau nu vor să conducă eficient.

Pentru a evidenția evoluția unui sistem productiv, în etapa de trecere la economia de piață, se consideră unele aspecte ale principalilor factori economici și tehnici: mediul socio-economic, resursele, tehnica și tehnologia, resursele umane și altele.

CONTRIBUTIONS À LA DETERMINATION DE LA VITESSE OPTIMALE DU GAZ POUR DES INSTALLATIONS DE TRANSPORT PNEUMATIQUE EN PHASE DILUÉE

PAR

CORNELIA IONESCU

1. Introduction. Le transport des produits sous forme de poussières, de granules, de fils et fibres textiles etc., lors des processus automatisés de l'industrie textile repose surtout sur la utilisation des installations de transport pneumatique.

L'une des méthodes les plus utilisées de calcul des dimensions des installations de transport pneumatique est la „Méthode énergétique de calcul“ [1].

Les difficultés qui apparaissent dans le calcul des dimensions de nouvelles installations permettant le transport pneumatique des nouveaux produits introduits ou résultats des processus de fabrication sont dues presque exclusivement à l'ignorance de deux paramètres:

- a) la valeur du coefficient de frottement produit-conduite (K);
- b) la valeur de la vitesse optimale de transport du gaz (w_{go}), paramètres établis expérimentalement pour une série de produits qui sont transportés pneumatiquement d'une manière courante.

2. La définition du coefficient de frottement produit-conduite (K). Le coefficient de frottement se définit comme tangent à „l'angle de talus naturel“. Autrement dit le coefficient de frottement (K) représente la tangente de l'angle solide (θ) formé par le produit trouvé en vrac à la surface d'une plaque horizontale confectionnée du même matériau (OL, PVC, etc.) que la conduite de transport, fig. 1 a.

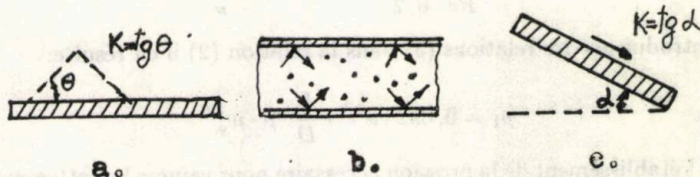


Fig. 1

Comme l'angle de talus naturel (θ) caractérise plutôt le frottement entre les particules du produit, on peut tirer la conclusion que le coefficient de frottement

(K) aura la même signification physique. Voyons dans la suite ce qui arrive pendant le transport d'un produit „suspension“, (fig. 1 b). Grâce à la grande vitesse du gaz de transport, les particules de produit exécutent des sauts successifs en heurtant les parois de la conduite et les distances entre les particules solides sont relativement grandes, donc ce qui importe ce n'est pas leur frottement réciproque mais le frottement entre le produit et les parois de la conduite (frottement qui a lieu au contact particule-conduite).

Dans cette situation le coefficient de frottement défini comme tangente de l'angle de talus naturel perd, si non entièrement, du moins en partie, sa signification physique; il est établie expérimentalement pour chaque produit à part [1].

À partir des observations et des vérifications effectuées dans les installations existantes, on a tiré la conclusion qu'on peut définir le coefficient de frottement (K) par la tangente de l'angle maximal d'inclinaison (α) dont les particules situées sur une plaque confectionnée du même matériau que la conduite de transport comme dans la fig. 1 c.

En définissant ainsi le coefficient de frottement on peut considérer qu'on a mieux saisi le sens physique de l'interaction produit-conduite.

3. La détermination de la vitesse optimale de transport (w_{go}). Soit une conduite horizontale, dans laquelle on introduit un produit dans un courant de gaz, dont nous désirons établir la vitesse optimale de transport.

Pour que le produit soit transporté d'un bout à l'autre de la conduite, il faut que le frottement gaz-produit-conduite soit vaincu par la différence de pression du gaz conformément à la relation:

$$p = p_1 + p_2 \quad (1)$$

La pression nécessaire pour vaincre le frottement gaz-conduite s'exprime par la relation:

$$p_1 = \lambda \cdot \frac{L}{D} \cdot \frac{w_g^2}{2} \cdot \rho \quad (2)$$

dans laquelle:

$$\lambda = \frac{0,184}{Re \cdot 0,2} \quad \text{et} \quad Re = \frac{w_g \cdot D}{\nu} \quad (3)$$

En introduisant les relations (3) dans la relation (2) il en résulte:

$$p_1 = 0,092 \cdot \nu^{0,2} \cdot \frac{L}{D} \cdot \rho \cdot w_g^{1,8} \quad (4)$$

Pour l'établissement de la pression nécessaire pour vaincre le frottement produit-conduite on applique les relations [1]:

$$p_2 = \frac{E}{P} = \frac{G \cdot L \cdot K}{Q} = \frac{4 \cdot G \cdot L \cdot K}{\pi \cdot D^2 \cdot w_g} \quad (5)$$

dans laquelle:

$$Q = \frac{\pi \cdot D^2}{4} w_g \quad (6)$$

Donc conformément à la relation (1), la pression nécessaire pour vaincre la frottement gaz-produit-conduit sera:

$$p = 0,092 \cdot \nu^{0,2} \cdot \rho \cdot \frac{L}{D} \cdot w_g^{1,8} + \frac{4 \cdot G \cdot L \cdot K}{\pi \cdot D^2 \cdot w_g} \quad (7)$$

En tenant compte de la relation B a r t h [3]:

$$K \geq \frac{w_p}{w_g} \quad (8)$$

il en résulte:

$$p = 0,092 \cdot \nu^{0,2} \cdot \rho \cdot \frac{L}{D} \cdot w_g^{1,8} + \frac{4 \cdot G \cdot L \cdot w_p}{\pi \cdot D^2 \cdot w_g^2} \quad (9)$$

Sur une diagramme ayant dans l'abscisse la vitesse du gaz (w_g) et dans l'ordonnée la différence de pression p , on obtient de la relation (5) la courbe représentée dans la fig. 2.

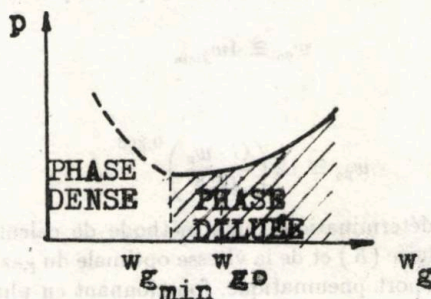


Fig. 2

Dans la figure 2, on observe que par la réduction progressive de la vitesse du gaz, la différence de pression décroît, jusqu'au moment où se produit une croissance brusque, ce qui est un signe que le produit a commencé à se déposer dans la conduite. Malgré ce dépôt le transport du produit continue, mais les pertes de charge décroissent rapidement quand la vitesse du gaz de la conduite est un train de décroître. On peut déduire qu'il y a deux types de phénomènes qui apparaissent pendant le transport pneumatique: l'un qui est apparenté à la mécanique des fluides appelé „la phase diluée“ et l'autre sans appartenance classique appelé „la phase dense“.

Le domaine du transport dans la phase diluée (en suspension) est séparé du domaine de transport dans la phase dense par la valeur de la vitesse minimale du gaz ($w_{g\min}$), pour laquelle le produit ne se dépose pas dans la conduite.

Autrement dit la vitesse minimale de transport ($w_{g\min}$) correspond la vitesse du gaz (w_g) à laquelle la différence de pression, p , enregistre une valeur minimale.

En imposant cette condition à la différence de pression, p :

$$\frac{dp}{dw_g} = 0 \quad (10)$$

de la relation (9) il en résulte:

$$w_{g\min} = 2,05 \left(\frac{G \cdot w_p}{\nu^{0,2} \cdot \rho \cdot D^{0,8}} \right)^{1/3,8} \quad (11)$$

En remplaçant dans la relation (11) les valeurs de la viscosité et de la densité du gaz situé dans les conditions atmosphériques, la relation (11) se simplifie ainsi:

$$w_{g\min} \cong 3 \left(\frac{G \cdot w_p}{D^{0,8}} \right)^{0,263}$$

Ayant comme base les expériences effectuées par B a r t h [2] sur la constante de bouchage et de transport des conduites, on est arrivé à la conclusion qu'entre la vitesse minimale et la vitesse optimale de transport il y a la relation:

$$w_{g0} \cong 4w_{g\min}$$

ou la relation:

$$w_{g0} \cong 12 \left(\frac{G \cdot w_p}{D^{0,8}} \right)^{0,263}$$

4. Conclusion. La détermination d'une méthode de calcul du coefficient de frottement produit-conduite (K) et de la vitesse optimale du gaz de transport pour les installations de transport pneumatique, fonctionnant en phase diluée, élimine leur détermination expérimentale et permet un calcul rapide des dimensions de ces installations par la méthode énergétique.

5. Abreviations:

- D - diamètre de la conduite;
- E - énergie nécessaire pour vaincre les frottements produit-conduite;
- G - débit quantitatif du produit transporté;
- K - coefficient de frottement produit-conduite;
- L - longueur de la conduite;
- p - différence de pressions nécessaire pour vaincre le frottement gaz-produit-conduite;
- p_1 - différence de pression nécessaire pour vaincre le frottement gaz-produit;
- p_2 - différence de pression nécessaire pour vaincre le frottement produit-conduite;
- Re - numéro Reynolds;
- ρ - densité du gaz;
- Q - débit du gaz;
- θ - ongle de talus naturel du produit;

w_p – vitesse de frottement de la granule de produit;
 w_g – vitesse du gaz;
 w_{g0} – vitesse optimale du gaz pour le transport;
 w_{gmin} – vitesse minimale du gaz pour le transport;
 λ – coefficient de frottement gaz-conduite;
 ν – viscosité du gaz.

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CONTRIBUȚII LA DETERMINAREA VITEZEI OPTIME A GAZULUI PENTRU INSTALAȚIILE DE TRANSPORT PNEUMATIC ÎN FAZA DILUATĂ

(Rezumat)

Viteza optimă a gazului, pentru transportarea diverselor produse cu instalații de transport pneumatic, utilizate frecvent și în industria ușoară, se determină experimental, în instalații pilot.

Lucrarea prezintă o metodă de calcul a vitezei optime a gazului de transport; metoda s-a stabilit în baza observațiilor și a verificărilor ce s-au făcut pe instalațiile existente, considerate cu regim optim de funcționare.



RECENZII

BOOK REVIEWS

CORNELIA VASILE and SEYMOUR B. RAYMOND, eds, *Handbook of Polyolefins - Synthesis and Properties*. Marcel Dekker Inc., New York, Hong Kong, 1993, 1091 pp., ISBN 0-8247-8978-4.

This book is an attempt to present a unified discussion of the structure, morphology, properties, processing, and applications of polyolefins for both fundamental and practical objectives.

Written by over 25 specialists in the field from the USA, Europe, and Russia, the Handbook of Polyolefins presents new results based on NMR, FTIR, capillary-gas chromatography, and thermal-gradient methods of fractionation investigation, explores the physical, mechanical, and electrical properties of polyolefins, reviews marketing data for several polyolefins and their impact on scientific and economic development, discusses polyolefins with inorganic fillers, composites, and blends. It brings together as completely as possible critical surveys of the literature based on European, American, Japanese, etc. sources, relying especially on earlier papers of the authors, all of whom are specialists in their respective fields.

In world production of synthetic materials, polyolefins hold first place (55%), for two reasons: their specific properties (high chemical and mechanical resistance, easy processibility, low specific gravity), which recommend them highly for a large range of applications, and the low quantity (about 7-8%) of extracted oil consumed for their manufacture, which explains the continuous growth in production volume. Of special significance in considerations of the present energy crisis are the projections by experts that by the end of the millenium, world production of polymers will be five times higher than that of steel - another result of the low energy consumption of the former.

Polyolefins also offer the advantage of possible production from renewable resources such as biomass. For the reasons just enumerated, polyolefins are produced almost everywhere in the world, and this popularity justifies the efforts undertaken for a periodic updating of the information in this field.

From the history of polyolefins to their various important applications, every significant progressive development and invention is covered in this book. There is little doubt that the Handbook of Polyolefins will become a major addition to the literature on these important and increasingly necessary materials.

Featuring more than 1 150 drawings, tables, and equations and over 3 000 literature citations, the Handbook of Polyolefins is a comprehensive tool for chemical and design engineers; polymer, analytical, materials, petrochemical, and pharmaceutical chemists; environmental scientists and technologists; upper-level undergraduate and graduate students and professional seminars in these disciplines.

V. Blașcu



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